MILITARY PERSONNEL ATTRITION AND RETENTION
RESEARCH IN PROGRESS

Edited by

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

During August 31-September 2, 1981, the Office of the Secretary of Defense sponsored a workshop on research dealing with military personnel attrition and personnel retention. The main purpose was to bring together researchers from both government laboratories and contract organizations to discuss the status of their work. Twenty-one presentations were made,

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ranging from reports of completed (but not yet published) research, through accounts of ongoing work, to plans for future studies.

This report contains a summary section highlighting the main points of the workshop papers and the discussions of them. The bulk of the report is a compilation of author-prepared summaries or abstracts.

MILITARY PERSONNEL ATTRITION AND RETENTION: RESEARCH IN PROGRESS

Proceedings of a Workshop
held at
Santa Monica, California

August 31-September 2, 1981

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Meetings of the type reported here don't just happen. They directly reflect the effort and dedication of support staffers. It is indeed our pleasure to acknowledge the contributions of James Beavers, Toby O'Brien, and Lorraine Scruggs, all of the Rand Corporation, for their on-the-scene attention to the many details of the workshop; and of Becky Caldwell and Becky Graham of the Smithsonian, who handled arrangements with participants and who saw to the publication of this report.

We wish also to acknowledge the essential role played by the services' research-supporting components in initiating and carrying on the work that was reported during the workshops: the Office of Naval Research, the Army Research Institute for the Behavioral Sciences, and the Navy Personnel Research and Development Center. The Office of the Assistant Secretary of Defense (MRA&L) also supported some of the work that was described in the workshop.

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BACKGROUND

Attrition--or the unscheduled loss of first term enlisted personnel--and the retention of adequate numbers of career persons continue to be major problems for the Armed Forces. Understanding the causes of attrition and retention and developing policies and practices for controlling their effects are important. Personnel losses are expensive because they drive up recruiting and training costs; more serious is the prospect of military missions degraded by manpower shortages. Given demographic projections of a diminishing manpower supply it is essential that undesired losses be reduced. The responsibility for dealing with these problems belongs, of course, to manpower managers. But in reviewing possible courses of action, policymakers should have access to information grounded in good research and analysis.

Recognizing this fact, the Office of the Secretary of Defense (Director of Defense Research and Engineering) and the Office of Naval Research sponsored a DoD-wide conference on first term enlisted attrition in April 1977.* That meeting had several purposes: a) to review the magnitude of the attrition problem; b) to learn about research, both inside and out of the DoD, that dealt with attrition; and c) to identify promising areas for new research.

Since the 1977 conference, and partly because of it, the services have been heavily involved in research dealing with personnel attrition; they have also undertaken research to identify factors affecting the retention of career personnel. Early in 1981, representatives of the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics) and the Office of the Under Secretary of Defense for Research and Engineering agreed that it would be an opportune time to convene a workshop, primarily for purposes of bringing researchers up to date on methodological problems, as-yet-unpublished data, and plans for future work. The meeting was also seen as an opportunity to begin to identify gaps, on the one hand, and duplicative efforts, on the other, in research coverage. From the perspective of the OSD participants the meeting would serve to correct a fragmented view of the field.

A steering committee (the editors of this paper) identified participants for the workshop and planned the agenda. As a way of promoting candor, speakers were encouraged to speak informally--and, if they wished, off the record. The meeting was small, with invitations extended primarily to researchers. Some non-researcher invitees, representing defense and other agencies having a high interest in military manpower issues, were also included. (See Appendix B for roster of workshop participants.)

The meeting was held at the Rand Corporation in Santa Monica during August 31- September 2, 1981. The work reported was evenly divided between

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*Sinaiko, H. W., (Ed.), First Term Enlisted Attrition (Vol. I: Papers) and Sinaiko, H. W., First Term Enlisted Attrition (Vol II: Summary). Manpower Research and Advisory Services, Smithsonian Institution, June 1977.

service laboratories and outside contractors. The agenda (see Appendix A) included time for informal discussion as a way of promoting interchange among the participants. Speakers prepared summaries of their remarks, and those papers make up the main content of this report. Some of the summaries are quite general, reflecting the tentative state of work being reported; others contain data and detailed findings.

HIGHLIGHTS

On the basis of the speakers' presentations and the general discussion that accompanied them, the editors note these main points:*

o There continues to be a sizable number of research efforts aimed at understanding how individuals' characteristics are related to attrition (Allen; Butler; Buddin; Finstuen & Berry; Blandin & Morris). There has, however, been a significant shift toward the study of unit and other organizational factors in attrition. For example, wide variations in attrition rates across platoons have been shown, and leadership styles of drill instructors and unit commanders have been shown to affect attrition and retention rates (Goodstadt; Majchrzak; Sarason; Elster & Thomas; Mobley, Fisher, Shaw, & Woodman).

o The availability of comprehensive data bases has enhanced research opportunities in the areas of personnel attrition and retention (Brandewie; Finstuen & Berry; Buddin); further, such data has made it possible to do comparative studies of these phenomena among U.S. and other western military forces (Sinaiko & Scheflen).

o Cohort tracking studies, in some cases going back to 1975, have led to the development of promising strategies for dealing with high-risk, attrition-prone individuals (Youngblood, Mobley & Meglino; Doherty; Buddin).

o There are important interactions between characteristics of recruits and the leadership styles of recruit training instructors. Under drill instructors with past histories of high recruit training attrition, non-high-school-graduates have very high attrition rates. But in platoons with records of low recruit attrition, non-graduates have much lower attrition rates. These differences cannot be explained on the basis of the characteristics of recruits (Sarason).

o Several special intervention programs for dealing with personnel attrition have been developed and tested experimentally. The subjects of such interventions have included Navy general detail seaman (Lakota), marine recruits (Youngblood, Mobley, & Meglino; Sarason), and marginal performers (Doherty).

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*Parenthetical notes refer to papers in the main body of this report.

o Attrition rates differ across occupations if one controls for the characteristics of the individuals in the occupations (Elster & Thomas; Sinaiko & Scheflen; Eaton & Nogami).

o The retention of career personnel has been less frequently the subject of research than attrition among first termers. Statistical methods have been applied to cross-sectional data to estimate survival rates (Lurie); and a causal model of Army reenlistment behavior is under development (Lawton). The importance of quality-of-life factors in career reenlistment behavior has been demonstrated for selected naval ratings (Fletcher). Economic factors, long known to be related to personnel retention, can be projected and their effects estimated in terms of force size and composition (Goldberg).

o Attitudes about jobs and the work environment are useful in discriminating "high-" and "low-intention-to-remain" personnel (Butler).

o The traditional wisdom that puts non-high-school-graduates in a high-attrition-risk category was challenged by an analysis of Army experience. Non-graduates, as a group, were shown to be far from homogeneous in their attrition behavior (Blandin & Morris).

o Relatively [illegible]oped areas for further study include: the transition of individuals in[illegible]nizations (Mobley, Fisher, Shaw & Woodman), the demand side of ret[illegible] (Borack & Doherty), and the diagnosis and ranking of retention proble[illegible]rack & Doherty).

* * *

These highlights are intended only to capture the flavor of the workshop. Interested readers should peruse the main body of this report--and, if they have questions, contact authors directly. (Appendix B contains the speakers' affiliations and telephone numbers.)

LONGITUDINAL AND EXPERIMENTAL ANALYSES OF FIRST TERM ENLISTED ATTRITION

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The University of South Carolina Center for Management and Organizational Research (CMOR) is currently pursuing programs related to attrition in both the Marine Corps and the Army. This report is a summary of our most recent efforts and is largely based on preliminary results. Various technical reports, dealing with earlier analyses, are available from CMOR directly.

U.S. Marine Corps

A number of investigations are currently underway using several samples of Marine Corps recruits. These investigations are best described by referring to the cohorts shown in Table 1.

Table 1

Marine Corps Cohorts

DESCRIPTION	LOCATION	N	DEMO GRAPHICS	PRE RT	POST RT	ADV TRAIN	DUTY STATION	PERF	PEER EVAL	SERIES TEAM EVAL	ATRIT	RE-ENLIST
MALES												
August 1976	PI	1520	X	X	X	X	X				X	X
July-Aug 1977	PI	484	X	X	X			X			X	
July-Aug 1977	SD	480	X	X	X			X			X	
January 1978	SD	381	X	X	X			X			X	
[illegible] 1978 (PIRATE)	PI	678	X	X	X			X	X	X	X	
Summer 1978 (9 WK POI)	PI	909	X					X	X	X	X	
FEMALES												
August 1977	PI	85	X	X	X			X			X	
February 1978	PI	90	X	X	X			X			X	

PI = Parris Island
SD = San Diego

Reenlistment

Our initial cohort of 1520 August, 1976 Parris Island accessions was administered a survey prior to the start of recruit training, near the end of recruit training, at advanced training, and at initial duty station. The survey measures included: expectations and perceptions of role rewards, job content, leadership, and the work group; satisfaction; attraction of both civilian and military roles; and behavioral intentions to complete the enlist-

ment and to reenlist. (see Griffeth, Meglino, Youngblood, and Mobley, 1979 for a more complete description of these measures and a cross sectional analysis at advanced training and initial duty station) As Table 1 shows, complete demographic information as well as actual attrition and reenlistment behavior is also available for this cohort.

The most recent investigation utilizing this cohort involves determining whether early leavers (attrites during recruit training) can be distinguished from later leavers (attrites after recruit training) based upon components of a turnover model (see Mobley, Griffeth, Hand, and Meglino, 1979). and whether later leavers can be distinguished from stayers based upon observed changes in key components of the turnover model which develop over time.

Results indicate that early leavers are clearly different from stayers on measures taken at the beginning of recruit training. Among the differences: leavers initially had significantly lower intentions of completing their enlistment, lower expectations of compieting thier enlistment, lower expected satisfaction, lower attraction to the military role, lower perceptions of work group attraction and expected leader structure, lower internal motivation and growth need strength, and higher perceived chances of findings an acceptable civilian job.

Later leavers generally exhibited different patterns of attitude changes over time than the stayer groups on the key components of the turnover model. Specifically, leavers during advanced training and duty station exhibited sharp declines in completion intentions prior to leaving. Later leaver groups also exhibited larger declines in net role force, job satisfaction, and perceived work group attraction over time.

All groups generally exhibited the most favorable attitudes toward the military upon completion of basic training, but showed a marked decline between basic training graduation and assignment to duty station.

Reenlisters with four year enlistment period exhibited initially higher completion and reenlistment intentions, higher attraction to the military, higher internal motivation and growth need strength, higher expected satisfaction, and more favorable job and work group perceptions. These differences initially between the four year reenlistment groups and the later leaver and stayer groups reappeared during the duty station and could be attributed to initial demographic differences as well as indiviuual by job interactions due to differential assignments to MOS categories based on initial demographic differences.

Discriminant analyses revealed that cognitive and attitudinal variables contributed significantly to the prediction of membership in either leaver or stayer groups. Completion chances, reenlistment intentions, military role attraction, and education were the best predictors of leaver versus stayer status. The distinction between completers and reenlisters, however, revealed that the demographic variables of education, AFQT score, race, and age were better predictors than cognitive or attitudinal variables. Demographic statistics for various stayer, completer, and leaver groups are shown in Table 2.

Table 2

Demographic Statistics for Leavers, Completers, and Reenlisters

Group	N[a]	Education (Years)	Race (% Cauc)	Marit Stat (% Married)	Mental (AFQT)	Age at Enlist (Years)
Leave during recruit training	218	11.36 (.99)[b]	76.1	7.3	57.90 (18.66)	19.19 (1.50)
Leave after training but before duty station	111	11.09 (.95)	79.3	5.4	59.76 (18.70)	18.98 (2.06)
Leave after duty station	82	11.37 (.85)	73.2	6.1	59.66 (18.56)	18.67 (1.66)
Complete three year enlistment	323	11.80 (.68)	76.5	1.2	54.97 (19.70)	18.86 (1.22)
Complete four year enlistment	557	11.88 (.59)	82.9	2.3	65.07 (18.46)	18.88 (1.29)
Reenlist after three years	35	11.80 (1.02)	65.7	5.7	59.11 (20.02)	18.94 (1.82)
Reenlist after four years	119	11.84 (.66)	76.5	8.4	65.93 (18.39)	19.30 (1.94)

[a]Number of observations vary slightly due to missing values

[b]Figures in parentheses are standard deviations

NOTE: Oneway analysis of variance and chi-square analyses yielded significant differences ($p < .05$) among the subject groups on all demographic variables.

Implications for the above results involve utilizing attitudinal and intention measures, in addition to traditional demographic measures, to identify high and low risk recruits at time of entry. This may also be extended to monitoring changes in key variables over the time of enlistment. Additionally, strategies directed at pre-entry socialization of applicants, which enhance self-selection and modify expectations appear most appropriate. Post-entry socialization strategies in conjunction with identification of high risk turnover groups at critical training and transition stages could also enhance retention. Specific strategies such as accurate portrayal of role information, organizational expectations, and career paths could assist recruiting and advertising efforts as well as stimulate anticipatory socialization. Post-entry socialization strategies might also employ: realistic previews prior to major transition points in training and job transfers, role modeling, the development of coping skills, differential job assignments and/or differential training and development strategies. Socialization strategies designed to enhance group cohesion may also provide a social support system for individuals identified as high turnover risks. An examination of the practice

of contingent leadership styles for high risk turnover groups might also improve retention and reenlistment.

Recruit Anxiety

Survey measures administered to the July-August 1977 (San Diego and Parris Island) and the January, 1978 (San Diego) cohorts contained measures of state and trait anxiety. A current investigation involves determining the predictors of state anxiety among recruits and examining the relationship between state anxiety and subsequent attrition.

Preliminary results showing the significant (using change in R^2 criterion) predictors of state anxiety prior to recruit training are shown in Table 3. Table 4 shows the significant predictors of state anxiety during the final week of training.

Table 3

Predictors of State Anxiety At Start of Recruit Training

Variable	r	R	R^2	ΔR^2	F
Chance of Outcomes Through Performance	.23	.23	.053	.053	15.02**
Confidence	-.21	.31	.094	.041	35.35**
Autonomy	-.19	.34	.112	.018	11.71**
Need for Clarity	.06	.35	.124	.012	17.69**
Organizational Commitment	-.22	.38	.141	.018	16.17**
Outcome Desirabilities	.19	.39	.153	.012	15.10**
Marine Role Attraction	-.19	.40	.159	.006	3.74**
Desire for Group Achievement	-.18	.41	.164	.005	9.33**
Motivation	-.01	.41	.168	.004	6.93**
Role Ambiguity	-.01	.41	.171	.002	3.90*
Marine Outcome Expectancies	-.19	.42	.172	.002	3.20

** $p < .01$
* $p < .05$
N = 1458

Table 4

Predictors of State Anxiety at End of Recruit Training

Variable	r	R	R^2	ΔR^2	F
Chance of Outcomes Through Performance	.21	.21	.043	.043	18.96**
Autonomy	-.19	.27	.074	.030	32.14**
Ouctome Desirabilities	.18	.29	.081	.008	12.50**
Confidence	-.08	.31	.094	.012	14.67**
Desire for Group Achievement	-.05	.31	.095	.001	1.83
Motivation	.04	.31	.096	.002	1.85
Marine Role Attraction	-.04	.31	.097	.001	3.10
Marine Outcome Expectancies	-.03	.32	.098	.001	1.72
Need for Clarity	.03	.32	.099	.001	1.24
Organizational Commitment	-.03	.32	.099	.0001	.09
Role Ambiguity	-.03	.32	.10	.0001	.06

**$p < .01$
$N = 1212$

In both cases the variable which explained the greatest amount of variance was a measure of the extent to which recruits felt that positive and negative outcomes in training were contingent upon their own performance. Recruits at both points in time also experienced less state anxiety if they were more confident in themselves and perceived greater autonomy.

The relationships between state and trait anxiety (as measured by the Taylor Manifest Anxiety Scale) and subsequent attrition are shown in Table 5. In both cases, relationships are significant and in the same direction although the amount of explained variance is extremely small.

Table 5

Attrition During Recruit Training

Predictor	r	R	R^2	ΔR^2	F
State Anxiety (T_1)[a]	-.08	.08	.006	.006	5.58*
TMAS	.09	.14	.019	.013	11.04**
State X TMAS	.04	.14	.02	.00013	.03

Table 5 (continued)

Attrition (40 Months) After Recruit Training

Predictor	r	R	R^2	ΔR^2	F
State Anxiety (T_2)[a]	-.10	.10	.009	.009	9.1**
TMAS	.05	.11	.012	.003	2.64*
State X TMAS	.01	.11	.013	.001	.85

N = 953
*p < .05
**p < .01
[a] T_1 measure taken at the start of recruit training.
[a] T_2 measure taken at the end of recruit training.

These results lend some support to early findings in Social Psychology (e.g., see Aronson & Mills, 1959) that a severe initiation generates greater attraction for a group. Specifically, greater state anxiety prior to training (anticipated) resulted in less attrition during training. Additionally, greater state anxiety at the end of training (retrospective) led to less attrition after training (up to 40 months). In both cases, high trait anxious individuals showed greater attrition propensity.

Subjective Evaluations

As Table 1 indicates, peer/subjective evaluations were gathered for the May 1978, and Summer 1978 cohorts. These evaluations were gathered as follows:

Series Team: Drill Instructors' and Series Commander's subjective estimation that a recruit would complete his enlistment (gathered at time of graduation from recruit training)

Subjective DI: Drill Instructor's subjective evaluation of a recruit's performance during recruit training

Positive Nomination: At the eighth week of training, recruits were asked to nominate the top five members of their platoon based on the likelihood that they would complete recruit training and become a good Marine. Score was = (# times person nominated 1st) (5) + (# times person nominated 2nd) (4) + ... (# times person nominated 5th) (1), corrected for number of individuals in platoon

Negative Nomination: Similar to positive nomination except for the bottom five members. Score was = (# times person nominated worst) (-5) .... (# times person nominated 5th worst) (-1), corrected for the number of individuals in the platoon

Composite: Sum of positive and negative nominations.

Table 6 shows the beta coefficients and significance levels for demographic and standardized performance predictors of each subjective evaluation described above.

Table 6

Predictors of Subjective Evaluations

VARIABLES	SERIES TEAM (795)[a]	SELF DI (855)	PEER POS NOMIN (723)	PEER NEG NOMIN (721)	PEER COMPOSITE (719)
Age	-1.6620***	-0.0335	0.0039	-0.0953**	0.0096**
Race	-0.7157	-0.3292	-0.0173	-0.0045	-0.0011
M Stat	2.3637	0.2135	0.0236	-0.0033	0.0237
Mental Grp	0.6775	0.0293	-0.0270	-0.0039	-0.0311
AFQT	0.0472	0.0266***	0.0013**	-0.0002	0.0015*
Yrs Ed	4.8146***	0.3016*	0.0131	-0.0140	0.0256*
HS Grad	-1.5368	-0.2644	0.0032	-0.0097	0.0162
Run	-0.0134***	-0.0010***	-0.0000**	0.0000***	-0.0000***
Pullup	0.5699***	0.0656***	0.0055***	0.0022**	0.0080***
Situp	-0.0129	0.0026	0.0009	-0.0000	0.0000
Water Surv	1.8555***	0.0958	-0.0008	-0.0003	-0.0009
Rifle	0.0641***	0.0089***	0.0002	-0.0000	0.0002
Pract Exam	0.9646***	0.0531***	-0.0001	-0.0007	0.0005
Duty Prof	0.4056	-0.0521*	0.0011	-0.0030**	0.0041*
R^2	0.1411	0.0792	0.1229	0.0837	0.1655

*** $p < .01$
** $p < .05$
* $p < .10$
[a]Number in sample

These results suggest that performance measures are most likely to exert a significant impact on various subjective evaluations. Exceptions are age, AFQT, and years of education particularly in the case of evaluations conducted by the Drill Instructor and the series team. In interpreting these beta coefficients one should note that sign reversals occur for negative nominations since these nominations are expressed with negative signs.

U.S. Army

CMOR has recently completed two video taped interventions for the U.S. Army. The first of these ("I Win: Basic Training in the U.S. Army") is a realistic preview of the significant events in basic training and is primarily descriptive in nature. This presentation explains the typical daily schedule in basic training and describes the various training events which occur during each of the four phases of training ("I Win" is an acronym for the four phases of basic training).

The second intervention is a video taped presentation which offers trainees advice on how to deal with various emotional events in basic training. Background material for this presentation was gathered from 149 structured interviews and from surveys administered to 325 trainees both in the first and fifth weeks of basic training. Data from both the interviews and surveys indicated that the most common problems for trainees were: living and working with new people; being homesick for family, friends, girlfriend or boyfriend; taking orders - Drill Sergeant yelling; and physical training. The content of the second intervention ("Adjusting to Basic Training") was based upon these results which included coping techniques utilized by successful trainees. A portion of the presentation was also devoted to instructing trainees on how to approach the Drill Sergeant and ask for help with a problem.

Both of the presentations described above have been approved by the Army Training and Doctrine Command and are currently being used at all basic training locations. An experimental evaluation of the effects of each presentation is currently in process at Ft. Jackson, S.C..

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CROSS-NATIONAL ANALYSES OF ATTRITION

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Background

The Technical Cooperation Program (TTCP) is a consortium organized to exchange defense R&D information among five nations. Participants are Australia, Canada, New Zealand, the UK, and the United States. The technical panel on military manpower trends, organized in 1978, has in its charter the area of enlisted personnel attrition, among other topics. Last year the panel built a data base that permitted the comparative analysis of attrition among male first term enlisted personnel in the Canadian, UK, and U.S. forces (Sinaiko et al., 1980). An outcome of that exercise was the decision to compile additional data in three areas: a) attrition among enlisted women; b) occupational correlates of attrition; and c) loss rates among officers.

1980 Collaboration

The initial collaborative effort was intended to do two things: determine whether collaborative research was possible from a technical perspective and determine the extent to which first-term enlisted personnel behaved the same in the military environments of the different countries and, within countries, of different services. The focus of this effort was on selected entry cohorts of male non-prior-service accessions.

With respect to the technical feasibility of collaborative research, it is clearly possible such research is not without a myriad of problems, pitfalls, and frustrations. The bottom line, however, is that it is possible to compare apples to apples and make some meaningful determinations about what these comparisons mean. From the substantive perspective, the general conclusion is that despite vast differences in scale, policies, educational systems, and social fabric, the attrition patterns and causes in the three countries studied are much more alike than they are different. Educational attainment and test scores bear about the same relationship to Canadian and UK attrition as they do for the U.S. Age factors are less comparable, perhaps largely due to the differences in the school-leaving age of the various educational systems.

The gross differences in the absolute magnitude of attrition rates are, in many instances, explained by differences in policy: the terms of enlistment, the "hard vs. soft" type of enlistment contract, early-out programs, etc. The data clearly show that if policies make it easy for either the individual or the institution to initiate a separation action, people separate at rates higher than the rates for systems where policies make it more difficult. Further, there is evidence that high early attrition is associated with "high rate of attrition" in the first three years, while low early rates are related to low three-year rates.

1981 Collaboration

Since the current effort is in preliminary draft form, no specific results of the analysis will be reported here. Data on female enlisted attrition rates, limited so far to Canadian and U.S. forces, showed relationships similar to those found for males: e.g., prior education and mental ability were both predictive of turnover in the expected direction. (That is, high school graduation and high test scores were associated with low attrition and vice versa.) When results were controlled for educational level, U.S. women had higher loss rates than men; the reverse was true for the Canadians.

In the examination of military occupations and attrition, the data showed two general trends: a) women had higher loss rates from technical (i.e., "non-traditional") jobs than from service and support jobs (i.e., "traditional"); b) both men and women experienced higher attrition from mechanical/technical occupations than from service/support trades, although male loss rates were lower than those for females in every case.

A continuation matrix approach to the analysis of long term retention was used. (The continuation matrix permits the calculation of loss rates for any category of personnel during a given period. In the present study we calculated loss rates by years of service for various enlisted occupational groups and for certain officer occupations as well.) U.S. data showed these trends: a) apprentices (enlisted personnel with less than five years of service) left their respective services at twice the rate of careerists (personnel with nine or more years of service); b) there were interservice differences in retention rates that apparently reflected service missions and occupational demands. Officer retention rates varied widely among services when similar occupational categories were studied.

Completion of the current analysis is awaiting additional data from participating countries.

Conclusion

While it is difficult at best to compare data sets among nations that differ widely in size, culture, and level of military commitment, we believe that the present exercise provides useful insights in our own military manpower problems.

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AIR FORCE ATTRITION RESEARCH: ANALYSIS OF PRE- AND POST-ENLISTMENT FACTORS

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Background

Enlisted attrition research in the Air Force traditionally has been directed toward personnel selection issues. Earlier studies of recruit adaptability or suitability were centered on the determination of those characteristics which predisposed certain enlistees toward premature loss from the service. Typically, applicants who were younger, and had lower aptitude and educational levels exhibited a higher probability of loss due to misconduct, failure to adapt, unfitness, or undesirable behaviors (Flyer, 1959; Fisher, Ward, Holdrege, & Lawrence, 1960; Gordon & Bottenberg, 1962; Guinn, 1973; Carpenter & Christal, 1973). The characteristics identified were used to establish general selection strategies aimed at enlistment of those applicants who did not have a potential predisposition toward attrition (Vitola, Guinn, & Wilbourn, 1977).

More recently, selection research has examined the use of additional paper-and-pencil tests for the identification of high attrition-risk recruits. Tests included a personal background inventory, and several attitudinal and interest measures (LaChar, Sparks, & Larsen, 1974; Guinn, Johnson, & Kantor, 1975; Guinn, Wilbourn, & Kantor, 1977; Guinn, Kantor, & Vitola, 1978).

Statement of the Problem

Over the past few years the Air Force has experienced a 30 to 40% loss rate in the first term enlisted force for all reasons, due both to separations for undesirable causes, and to "no-fault" type separations viz., disability, hardship, childbirth, and release to other service, national guard, or reserve units. In addition, career motivation in the second and subsequent terms appears to be diminishing; only 60% of the eligible second-term airmen reenlisted in fiscal year 1980 (deCento, Note 1). Not only are fewer people remaining in the Air Force, but in the future there will be fewer from which to draw for entry to the first term. The pool of eligible 18 year olds is shrinking due to the decrease in the birth rate over the past two decades. In the future, the military services will have more competition from business, industry, and other governmental agencies for entry level personnel, while simultaneously attempting to retain their career forces.

The purpose of this paper is to provide a methodological overview of two recently completed, and two on-going AFHRL research studies which examine pre- and post-enlistment factors associated with attrition and retention in the Air Force. Each of the four studies will be summarized briefly in terms of background, and the approach and methods employed in the investigation of enlisted attrition and retention. Results are presented for the two completed projects, and anticipated results are discussed for the two on-going studies.

Occupational Correlates of First-Term Tenure

The first completed project examined differences in continuation rates among first-term enlisted airmen in 186 occupational groups to determine the combined effects of individual and job attributes upon enlisted tenure(Finstuen & Alley, Note 2).

A sample of 280,039 airmen entering the Air Force between 1970 and 1973 provided the data base for the study. Losses from basic military training, hospital patients, and prisoners were excluded from the analyses.

Two tenure criteria were developed. The first measure was the number of months airmen had served up to 36 months. The second measure was a variable coded 1 if the airman was still in the service after 36 months, 0 otherwise. Independent variables consisted of 27 pre-enlistment personnel screening measures reflecting attributes such as age, sex, aptitude, education, and family-dependent information. In addition, 186 binary predictor variables coded to identify each of 186 Air Force occupational specialties were generated.

A set of four multiple linear regression equations was developed to examine the personnel and occupational correlates associated with airman tenure. The first prediction equation consisted of the 27 pre-enlistment personnel screening variables. The second equation contained the 186 binary occupational variables. The third equation consisted of each personnel variable interacted with each occupational variable, resulting in a 5,208 predictor, fully interacted regression equation. The last 213 variable main effects equation consisted of the 27 personnel variables plus the 186 occupational variables.

As expected, equations based on the pre-enlistment variables were highly predictive of both tenure criteria. In addition, very significant differences were observed among tenure rates based on occupational group membership. Attrition rates varied widely across occupational specialties, from a low of 1.76% for flight engineers to a high of 84.36% for linguists, with an overall loss rate of 35.88%.

To determine whether the combined effects of pre-enlistment variables and occupational information were independent of one another with respect to tenure, the main effects regression equation was tested against the fully interacted regression equation. Significance tests revealed that predictions of both tenure criteria were differentially influenced by the combinations of pre-enlistment personnel attributes specific to each post-enlistment occupational grouping. This finding indicated that tenure predictions can be enhanced when made on an individual occupational basis, considering each Air Force specialty as a separate predictive framework. The 186 occupation selection equations are available for inclusion in the Air Force PROMIS system, the computer-based enlistment quota reservation program currently being refined at AFHRL.

Predictions of Job Satisfaction, Reenlistment Intent, and Retention with the Occupational Attitude Inventory

The purpose of the second recently completed study was to assess the predictive validity of occupational attitudes related to global job satisfaction and reenlistment intent, and to provide predictions of actual reenlistment behaviors for first term airmen (Finstuen, Weaver, & Edwards, Note 3).

The Air Force Occupational Attitude Inventory (OAI) was administered to two samples of first-term airmen consisting of 1,217 personnel in 1973, and 4,784 personnel in 1975. Phase I of the study validated airman responses to 189 specific job attitude items against a self-report measure of global job satisfaction and against a measure of reenlistment intent. In Phase II, a longitudinal follow-up of individual airmen using information from separation files was conducted to determine the relationship between occupational attitudes and reenlistment versus separation from military service. Samples for both years were divided into several data sets. One set considered reenlistment versus voluntary separation, and another included reenlistment versus voluntary and involuntary discharges combined. In addition, personnel were further identified by formal eligibility for reenlistment. Multiple linear regression equations were constructed to assess the effects of occupational attitudes with respect to the attitudinal and behavioral variables while controlling for the effects due to biographical variables (e.g., age, education, aptitude, marital status, and gender) and occupational variables (e.g., 18 duty and control Air Force Specialty Codes -- AFSC's, number of months on the job, number of people supervised, and grade).

Statistical analyses, revealed that occupational attitudes contributed significantly to the prediction of all criteria, over and above the amount of variance explained in the criteria by the selection and assignment (biographical and occupational) control variables. To determine the stability of the OAI equations, the least squares regression weights developed on the 1973 samples were cross applied to the 1975 samples, and vice versa. Results from the cross validations indicated that the occupational attitude effects reflected stable and consistent relationships with global job satisfaction, career intent, and reenlistment across time. Specific occupational attitudes linked with global job satisfaction included job interest, challenge, use of abilities, and accomplishment. Occupational attitudes linked with career intent included pay and benefits as compared to civilian jobs, the removal of irritants, the consideration that airmen received from the Air Force, and the opportunity to contribute to the national defense. Occupational attitudes linked with actual reenlistment versus separation behaviors included pay and benefits compared with civilian jobs, the consideration that airmen received from the Air Force, and educational and recreational opportunities. Airmen who were not satisified with these items were more likely to leave the service. These findings were consistent for samples composed solely of airmen eligible to reenlist, and for samples composed of both eligible and ineligible airmen. Findings were also consistent across samples composed of airmen who voluntarily separated from service, and for samples composed of both voluntarily and involuntarily separated airmen. Overall, these results indicated that post-enlistment on-the-job attitudes should be considered as well as selection and assignment factors when designing programs to curtail attrition and enhance retention.

Personnel Factors Related to Attrition and Retention

The goal of this recently initiated work unit is to examine the effects of variables used in recruit selection and screening processes. New variables will be used to modify the selection, classification, and assignment program in the hope of curtailing attrition and enhancing

retention in the enlisted force.

Two data files are being constructed. The first contains pre-enlistment information and numerous personnel and occupational variables for accessions from 1 January 1977 through 30 June 1977. This file will contain records on approximately 50,000 airmen. The second data file is arrayed by cohort for all airman accessions from July 1970 to September 1980 and, while less pre-enlistment information is contained in this file than in the first file, there are data on nearly 800,000 airmen. To both files will be added several hundred Special Program Designation (SPD) variables. SPD's are specific types of codes used to identify categories of reenlistments, extensions, and losses. These SPD codes will be clustered in various ways to create a taxonomy of attrition and retention criteria and will be used to provide definitions of loss criteria which will be comparable with indices used by various DoD, civilian, and other governmental agencies. The first file will be used to identify pre-enlistment factors which will permit more precise selection predictions. The second file will be used primarily to identify cohort and time-related effects in relation to changes in the quality of the force which may be used to study attrition and retention trends.

Process Models of Personnel Turnover

The second recently initiated study is concerned with the time-related factors that influence an individual's continuation or attrition decision and the factors which influence those same decisions for the organization. While the companion study mentioned above is concerned with the pre-assignment phase of enlistment, this study will look at enlistees after they have been assigned to and are working in Air Force jobs.

Outcomes from decisions regarding turnover may be conveived of as a 2 x 2 matrix, with an airman's decision to stay in or exit the service arrayed along one dimension, and the organization's decision (i.e., supervisor or commander) as to whether that airman should stay in or exit the service arrayed along a second dimension. This results in four possible decision outcomes, three of which result in attrition. Only when airmen elect to remain, and the Air Force wants them to, does the joint decision result in retention. Joint decisions are made throughout an airman's term of service, from initial job assignment, through Airman Performance Reporting actions, reassignments, and at career decision points. Different factors are probably important for decisions at different times. The goal of this study is to identify those factors that influence exit-stay decisions at various career points, and to suggest ways in which it might be possible to modify those decisions.

The first step involves developing methods to quantify individual and organizational predictors of turnover. Next, self-report questionnaires which will assess return-on-investment perceptions will be designed and administered to 15,000 first- and second-term enlisted airmen three times over the next five years. Factors related to attrition and retention will be evaluated with the use of multiple linear regression analyses to examine both cross-sectional trends in relation to career intent, and longitudinal trends in relation to actual attrition and retention behaviors.

In addition to the sample survey, a case study of approximately 100 airmen will be conducted. These airmen will be interviewed by telephone on a quarterly basis and their perceptions of the factors which influence

turnover decisions will be content analyzed. Personnel files maintained at AFHRL will be used to track airman losses and current assignments for both samples.

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NAVAL POSTGRADUATE SCHOOL THESIS RESEARCH ON ENLISTED ATTRITION AND RETENTION

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Introduction

Military officers who are students in the MPT analysis curriculum must complete a thesis in order to receive this masters degree. The thesis work must represent analysis of DoD MPT issues and data. A number of these theses have dealt with enlisted attrition and retention; this paper summarizes those theses.

Attrition

NPS theses dealing with first-term enlisted attrition have used a variety of predictor variables. Some theses have used only pre-enlistment individual differences variables, e.g., age, level of education, and mental group as predictors. The emphasis, however, has been, and will continue to be, on simultaneously using pre-enlistment variables with in-service variables as predictors of attrition. Among the in-service variables used as attrition predictors have been variables describing jobs, assignments, and ships. On-going and planned thesis work will add new types of in-service variables as attrition predictors. Among the new variables will be deployment and overhaul schedules, commanding officer changes, time-at-sea, and assignment pattern, e.g., shore → sea, sea → sea, etc. Table 1 lists the predictor variables.

TABLE 1

Thesis Research on First-Term Enlisted Attrition: Predictor Variables

Pre-service variables

- Age[a]
- Sex[b,d]
- Mental group[a]
- Race[a]
- No. of dependents[a]
- Educational credential[a]
- Prior enlistment[b]
- Highest year of education[a]
- Job corps data, e.g., reading score, area of training[c]

In-service variables

- Navy job, e.g., Navy rating
- Assignment, e.g., ship or shore
- Ship variables, e.g., age, size, type, engineering plant, deployment and overhaul schedule[d]
- Time-at-sea, i.e., number of days an individual spent at sea[d]
- Ships' commanding officer changes[d]
- First-termers' assignment patterns, e.g., shore → sea, sea → sea, etc.[d]
- Participation in an experimental counter-attrition program

[a] Army, Navy and DoD (aggregated over services) samples
[b] Navy samples only
[c] DoD (aggregated over services)
[d] Variable being used for first time in on-going or planned thesis.

The following paragraphs provide brief descriptions of theses on enlisted attrition that have been completed at the Postgraduate School.

Smith and Kendall (1980) sought to identify predictors of first-term Navy enlisted personnel attrition and to determine the relative influence of various individual and organizational factors on attrition. A cohort of non-prior service recruits was tracked over a 34-month period, and the attrition rates of general detail and Navy A-school personnel holding a voluntary release option were compared to those of a control group not holding such an option. Whereas the traditional demographic predictors, in isolation, explained only a small percent of the variance in the dependent variable (attrition), a marked improvement in accuracy of attrition prediction was observed following the inclusion of various organizational and situational factors, such as Navy school attended, entering rate/occupation, and initial fleet assignment. These variables added significantly to the accuracy of attrition predictions.

Butcher (1980) studied the difference in first-term attrition rates between a group of personnel who had attended the Positive Motivation Unit (PMU), RTC Great Lakes, Ill. and a sample of the U.S. Navy male recruit population (control), for a period covering January 1977 through September 1979. Eleven cohorts, of 90 days each, for the PMU and control groups were tracked over the period (1977-1979) and their attrition rates were compared. Cross-tabulation, discriminant, and multiple regression analyses were performed to examine PMU and control groupings and their observed attrition. The traditional biographic/demographic variables explained only a small portion of the variance in the dependent variable (survival), while the inclusion of certain situational variables, such as initial duty assignment, greatly increased the accuracy of the prediction of survival, for both the PMU and the control groups.

Gardner (1980) compared the characteristics and attrition rates of first-term enlisted personnel initially assigned to ships with those assigned to non-ship duty stations. Traditional and non-traditional variables with emphasis on ship characteristics were evaluated as predictors of first-term attrition rates.

A cohort of non-prior service male recruits was tracked over their first 33 to 36 months in the Navy. The attrition rates for ship and non-ship duty personnel were compared using regression analysis techniques. Overall, the cohort initially assigned to ships had significantly lower attrition rates than those assigned to non-ship duty. Submarines experienced an attrition rate approximately one-half that of other ship types. The relatively low attrition rates from submarines may be due to high screening criteria and to the fact that sailors found to be inadequate performers are often transferred to the surface fleet. The mental group mix assigned to ships was not representative of the mental group mix of the entering cohort. The data showed under-representation of upper mental group and A-school trained personnel assigned to ship duty. This finding warrants further investigation, particularly because the sample excluded personnel entering via the Delayed Enlistment Program.

Ships' unique variables (e.g., ship type, engineering plant, homeport) did not appear to have a significant relationship with attrition. This thesis

should be considered as groundbreaking in nature, and its findings considered carefully until it is replicated with a more representative sample of personnel.

As part of a thesis concerning re-enlistment of prior service Navy personnel, Hawkins (1979) investigated the attrition rates of those personnel after they had re-enlisted after broken service. He found that prior service personnel had, as one would expect, much lower attrition rates after re-enlisting than did personnel who were in their first enlistment.

In January 1976, the Armed Services Vocational Aptitude Battery (ASVAB) was adopted as the single DoD test to determine qualification for enlistment and elibigility for assignment to military occupations. Subsequent to the implementation of the ASVAB, analyses of the test's norming (i.e. conversion of raw scores to percentiles) were conducted which revealed a norming error. As a consequence, individuals had been enlisted into the Armed Forces who would otherwise have been ineligible for military service had the test been correctly calibrated. Boyer (1931) examined the performance of a sample of nonprior service males who, because of the misnorming of the ASVAB, were enlisted into the Navy. In terms of survival on active duty, completion of A-School, and attainment of paygrade E-4 or higher, those individuals who were erroneously enlisted did not perform as well as those who would have been eligible regardless of the norming error.

Hawkins (1980) and Keating (1981) both analyzed the effectiveness of an experimental program intended to lower Navy first-term enlisted attrition. The experimental program was at the recruit training center (RTC), Great Lakes, Illinois.

The results demonstrated that the experiment was successful in reducing first-term enlisted attrition by 1.22 percent after 14 months of service when compared to a control group. This difference was not statistically significant at the .05 level. The reduction in attrition as of mid-1981 does not appear to justify the cost of the experimental program. Unless the difference between experimental and control group attrition rates increases markedly, the experimental program should not be institutionalized.

Griffin (1981) developed a first-term attrition severity index for 85 United States Navy enlisted ratings. The multiattribute model utilized in the development of the index was constructed using five rating-specific factors: 1) attrition, 2) replacement cost, 3) size (number of personnel in the rating), 4) shortage or excess of billet requirements, and 5)priority. The model provided first-term attrition severity indicators for the 85 ratings included in the study, indicating the diverse impact of attrition across Navy ratings and providing a practical basis for assigning scarce manpower resources to enlisted ratings experiencing the most severe effects of first-term attrition.

Ersoy (1979) investigated the relationship of pre-service variables to first-term attrition from the Army. The predictor variables used included educational credential (e.g., GED), mental group, age, number of dependents, and race. A linear-group prediction model was developed which accurately fitted the group attrition rates.

Carrier (1980) used Job Corps and DoD files to determine the number and types of Job Corps attendees who enter the military, and to investigate the attrition rates of Job Corps personnel who had joined the military. His results showed that high school graduates and non-high school graduates who entered the military after having been in the Job Corps had higher attrition rates than did those groups among non-prior service males in general. On the other hand, GED-holders who joined the military after having been in the Job Corps had slightly lower attrition rates than GEDs among non-prior service males in general.

Retention

Four theses have been completed at the Postgraduate School that deal exclusively with Navy retention. The first two to be discussed used retention intentions as indicated on the, 1978 DoD Survey of Officers and Enlisted Personnel.

Rikard (1980) investigated the effects of several possible replacement retirement plans on an individual's expressed propensity to remain on active duty. This was accomplished by comparing the intended retention of individual sample groups both under current retirement policy conditions and after exposure to alternative retirement plans.

The entire sample consisted of over 9,000 enlisted and 5,000 officer personnel. The proposed retirement systems contained many characteristics of past and possible future replacement retirement plans.

Results indicated substantial sensitivity of retention propensities to alternative retirement systems. Junior officer and enlisted retention propensities under proposed alternative retirement plans were generally as good or better than current indications.

The second thesis that used data from the 1978 DoD survey was by Siggerud (1980). Siggerud studied the social, environmental, and economical factors that influence the enlistees' decision to reenlist or leave the U.S. Navy. Results are presented both at the aggregate level, and for each of the largest ratings separately. A model for computation of the U.S. Navy's savings from personnel, along with a sensitivity analysis of some of the involved variables, was developed.

Siggerud concluded: retention policies and initiatives should be based upon separate studies of each Navy rating; objective information about civilian earnings might improve retention of enlisted personnel; pay should be based more upon pay in comparable civilian occupations.

The next two theses to be discussed used economic variables as predictors of the retention rates of Navy career enlisted personnel.

Bradley (1980) developed a statistical model to predict Navy career retention rates. The statistical model utilized economic variables as predictors. The model developed had a high correlation with Navy career retention

rates. The problem of Navy career retention has not been adequately studied, and this thesis provided an initial examination of this area. The findings indicated Navy policy-makers should be cognizant of the relationships of economic factors to Navy career retention rates.

Following Bradley's thesis, Bepko (1981) investigated the reenlistment behavior of U.S. Naval personnel who have completed more than two enlistment terms in the Navy. The Navy's 110 ratings were grouped into 24 occupational fields which represented clusters of similar skills, similar working conditions, and similar duty assignments. Multiple regression techniques were used to examine the relationship of economic variables to career reenlistment behavior.

The main conclusions of the thesis were: Economic variables such as military compensation, unemployment, and civilian wage opportunities were statistically significant predictors of career petty officer retention behavior, an all-navy reenlistment rate can very accurately be predicted using a regression model with economic variables; such regression models generally have very low predictive ability when derived from and applied to petty officers grouped into occupational fields.

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NAVY ENLISTED ATTRITION: DESCRIPTION AND INTERVENTION

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Introduction

Navy manpower planners have been concerned about high attrition rates among enlisted personnel, specifically first term enlistees (Landau & Farkas, 1978). In order to determine factors related to high attrition levels, two descriptive studies were conducted at the Navy Personnel Research and Development Center (NPRDC). These were (1) the design and analysis of the Enlisted Separation Questionnaire (ESQ) administered to all individuals separating from the Navy, and (2) an analysis of longitudinal surveys of enlisted personnel. In addition, the Navy is implementing innovative approaches to retrain the marginal sailor who is likely to become an attrition statistic.

NPRDC is evaluating one such retraining approach in the format of two pilot Correctional Custody Units (CCUs) and a Behavioral Skill Training (BEST) program.

A discussion of these three projects will follow.

Enlisted Separation Questionnaire

The Enlisted Separation Questionnaire is administered to all persons leaving the Navy during the exit process. It consists of two parts: background questions and thirty items listing reasons for leaving (e.g., too many petty regulations and dislike sea duty). In 1980, 7,400 regular Navy enlisted persons completed the questionnaire, with most of the sailors being in their first enlistments. While a small number of people agreed that every item was important, 75% of the sample agreed with ten or fewer reasons.

The reasons most often marked as extremely important were reduced in number and clustered through factor analysis separately for three enlistment periods. The following eight factors resulted: (1) pay, (2) amount of work, (3) non-permanent home, (4) regimentation, (5) loss of benefits, (6) quality of benefits, (7) skill utilization, and (8) supervision. Not too surprising, the results indicated that pay was the most important reason for separation, since it was selected by over 50% of the respondents. The second reason cluster was non-permanent home. However, pay was not selected as extremely important by over 40% of the sample. Other clusters of reasons for leaving were also found to be critical, and these varied depending upon the particular enlistment of the individual. For example, supervision (including unfair treatment and too many petty regulations) and skill utilization were very important for first enlistment personnel, while loss of benefits reasons were highly important for third term enlistment personnel; as might be expected since the percentage of marrieds also increases.

When each reenlistment group was further divided into an attrition group prior to EAOS and satisfactory completion of the enlistment as well as critical versus noncritical ratings, the reasons for separating are essentially the same.

Further analysis of this questionnaire should be conducted in order to make specific policy recommendations aimed at subgroups at different enlistment points.

Longitudinal Analysis of First Term Enlisted Personnel

The basic purposes of this study were to identify the causes of first term enlisted attrition and reenlistment and to recommend management strategies to reduce attrition. Five attitude questionnaires were administered to a group of first term personnel at various points in their enlistment cycle (pre and post boot camp, eight months following boot camp, at the end of two years of service and prior to EAOS). Over 700 sailors returned all questionnaires. The results indicated that for the first two years the stated intention to complete the enlistment has been established. Other variables, however, indicated a general decline in attitudes and commitment toward the Navy. Intention to reenlist has decreased over the first two years (24% to 8%), as has the intention to make the Navy a career (25% to 3%). However, there were substantial undecided groups in both cases. When examining the responses to the reenlistment questionnaire (prior to EAOS) the number of uncertain responses has decreased considerably, with 22% intending to reenlist and 10% intending to make the Navy a career. Presently this questionnaire is being merged with the enlisted master record to determine the factors related to actual reenlistment.

Attrition during the first two years of enlistment was previously found to be associated with stated intentions not to complete the enlistment, perceptions of limited advancements, negative duty station and supervisory experiences, as well with performance measures such as demotions, few promotions, UAs and desertions. It is evident from these data that duty station experiences (organizational variables) have an important influence on subsequent attrition. Further attempts to reduce attrition should focus on modifying organizational practices and policies.

Retraining the Marginal Sailor

The Navy has established three pilot retraining units aimed at redirecting errant, but potentially productive sailors prior to their becoming disciplinary problems or part of the Navy's first term enlistment attrition statistics. The Correctional Custody Units (CCUs) at Pearl Harbor, Hawaii and Coronado, California, have 30 day programs in which individuals can be sent as a result of receiving non-judicial punishment (NJP) on the recommendation of their commanding officers. The third program, Behavioral Skills Training Unit (BEST) at Norfolk, Virginia, is similar but does not require that an individual receive an NJP. Commanding officers may recommend a low performing sailor to BEST if they feel that the sailor may benefit from the program. In general, the three programs are similar with respect to goals, staff selection and curriculum.

Program

The curricula consist of general military training, physical training, productive work, counseling and professional development. The major difference among the programs is that Coronado and Hawaii devote considerable

time to working parties, while BEST has no specific scheduled working time, but spends more time on attitude and motivational classes.

Progress for individuals sent to CCUs and BEST is based on fulfilling daily requirements, and the training is behaviorally oriented. There are modules on goal setting and how to prepare for a Navy career. In addition, the staff is carefully selected for both exemplary appearance and outstanding leadership traits. The environments of the programs are vigorous and demanding, stressing leadership by example and personal development with instruction conducted in a strict disciplinary context.

Population

The characteristics of the sailors sent to the retraining units are similar. They are young (19-20 years old), with Hawaii receiving the oldest sailors and Coronado the youngest. Approximately 70% are in mental category IIIA and IIIB, with Coronado receiving more IIIA sailors than the other two programs. At Hawaii 50% are high school graduates, while 58% at Coronado and 60% at BEST are high school graduates.

The frequency and distribution of NJPs differed among the programs. BEST had fewer offenders (27% had no NJPs), Hawaii had the worst offenders (80% with 2 or more NJPs), and Coronado received moderate offenders (57% with 2 or more NJPs). Unauthorized absence was the largest offense category (50%), followed by offenses against authority (30%). In general, individuals are sent to CCU and BEST as the result of committing a military offense, not a civilian offense.

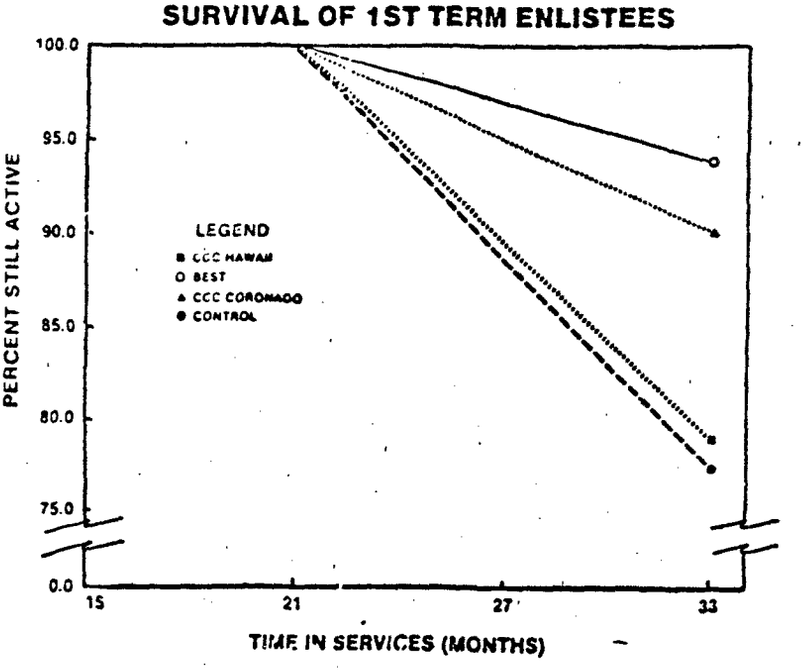
Results

Three basic outcome measures were used to evaluate long term program effectiveness: (1) follow-up supervisory performance ratings, (2) recidivism rates (individuals who received an NJP after retraining, and (3) survivability rates (percentage of individuals who remained in the Navy for a specific length of time).

Supervisory performance ratings indicated, in general, that while performance improved two months following retraining, it decreased at six months.

There was a dramatic reduction in discipline actions following retraining. Fewer than half the individuals were recidivists at Hawaii, 33% at BEST and 17% at Coronado.

The third evaluation measure was whether the sailors sent to CCUs and BEST survived longer in the Navy than would be expected for a group of sailors with similar characteristics and disciplinary records not sent to a special program. A control group was identified from the enlisted master record for a group of sailors with approximately 21 months active duty (the average point in the enlistment at which sailors were sent to CCU or BEST). In addition, they were selected on mental category and for their UA or demotion records. The control group was then tracked for one year as was the retrainees. The survivability rates are shown in the figure for both CCUs and BEST and the control group.



Considerable differences exist in the rates. Individuals from all three units survived longer than did the control group. However, more sailors from BEST (95%) and Coronado (91%) remained in the service at one year than did those from Hawaii (80%). It is evident from these data that CCU Coronado and BEST are effective in reducing attrition and recidivism of first term enlistees having difficulties meeting their obligations. While it is not possible to determine why the survivability rates differ so widely, it is is apparent from the descriptive data that Coronado and BEST receive a somewhat higher quality sailor than does Hawaii (high school graduates and number of NJPs).

Recommendations

CCUs and BEST should be integrated into an overall approach which addresses disciplinary problems. Once the purposes of each program (e.g., brigs, CCUs, etc.) is determined, standard procedures can be developed and operationalized.

Also, in order to determine the effectiveness of the CCU programs in the future, it is necessary to continue to monitor outcomes and integrate the evaluation process into the overall programs.

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AN IDEALIZED NAVY RETENTION RESEARCH PLAN

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Introduction

The extent to which the Navy can achieve an optimal force level and fulfill its mission directly relates to its ability to manage its manpower resources and retain its qualified military personnel The importance of retention has been cited in several sources. For example, the Secretary of the Navy (SECNAV memos, 11 September 1979 and 17 June 1980) indicated that retention of well trained military personnel of high quality is a top priority of the Department. The career enlisted force, especially those individuals highly trained in demanding technical fields were viewed as particularly important. In a memorandum of 11 December 1979, the Chief of Naval Operations noted that it was necessary "to continue pressure toward resolution of the retention problem . . . manning up the Navy must remain our highest order of priority" . . . In spite of this, a recent General Accounting Office report noted that military personnel management was hindered by the lack of management tools to evaluate the effectiveness of personnel policy decisions. It is recommended that the services "establish a more systematic approach to the development and evaluation of manpower and personnel policy programs".

Objectives

In view of these statements, it is clear that a Navy retention research program should have as its principal objective, the enhancement of the Navy's ability to manage attrition/retention (i.e., personnel continuance) in a timely, cost-efficient manner. Specific objectives should include:

1. Enhancement of the Navy's ability to identify, forecast, and monitor retention problem areas.

2. Development of plans and policies to remedy major retention problem areas.

3. Testing and evaluation of the effectiveness of recommended changes in terms of attrition/retention and associated costs.

Retention Research Outline

Ideally, a retention research program might include the following steps.

1. Description and analysis of current retention levels. Before current retention levels can be assessed, it is necessary to agree on definitions of retention terms (e.g., retention rate, reenlistment rate, careerist, etc.) This will allow research findings to be coordinated and key personnel sub-groups to be compared systematically. Consistent methods for quantifying these terms must also be established. Further, the magnitude of current retention levels should be ascertained and historical data analyzed to determine retention patterns that may be compared with present retention data. Needless to say, data requirements must be established and systems for obtaining such data must be developed.

2. Determination of the relationship among retention-related variables for subpopulations and at key career decision points. Clearly, retention-related variables interact with the subpopulations and career points being studied. Therefore, variables must be considered in a multivariate design in which combinations of retention factors are investigated. Factors related to the individual (demographic, interest, skill), factors related to the organization (reduced manning, crisis management, etc.), factors related to organizational policies, (directives, etc.), and factors external to the Navy (economic conditions, societal attitudes, etc.) must all be considered.

3. Forecasting of future retention levels. Quantitative techniques must be developed to forecast future retention levels. By integrating the identified retention-related variables discussed above with information regarding their saliency in the future (e.g., airline forecasts for hiring Navy pilots), future retention levels may be predicted and serve as an aid in identifying future problems.

4. Determination of required retention rates. The results of manpower requirements research should be integrated with supply and related efforts to arrive at statements of required retention rates.

5. Diagnosis and prioritization of present and future retention problems. By analyzing the discrepancies between the current and required retention levels for both overall personnel and specific subgroups, retention problem areas may be identified. These problem areas should be prioritized based upon criticality, cost and duration of training, external supply, etc.

6. Design of interventions/policies. Based upon the established problem priorities, interventions and policies designed to ameliorate retention problems should be developed. Simulation, surveys, experimental efforts, etc., can provide preliminary tests, analyzes and evaluations leading to recommendations for policies to be tested on a broad scale.

7. Test and evaluation of interventions/policies. These tests would include large-scale field experiments, and evaluations of major policy changes. They would likely require the participation of several commands and include both long and short term evaluations.

8. Comprehensive analyses and recommendations. Recommendations should be based upon the tests and evaluations of the previous step as well as previous retention research and extensive costs-benefit analyses.

It is hoped that this research outline will aid in the structuring of retention research efforts. It is important to note, however, as the diagram below indicates, that such an effort must be integrated with requirements research if it is to produce significant results.

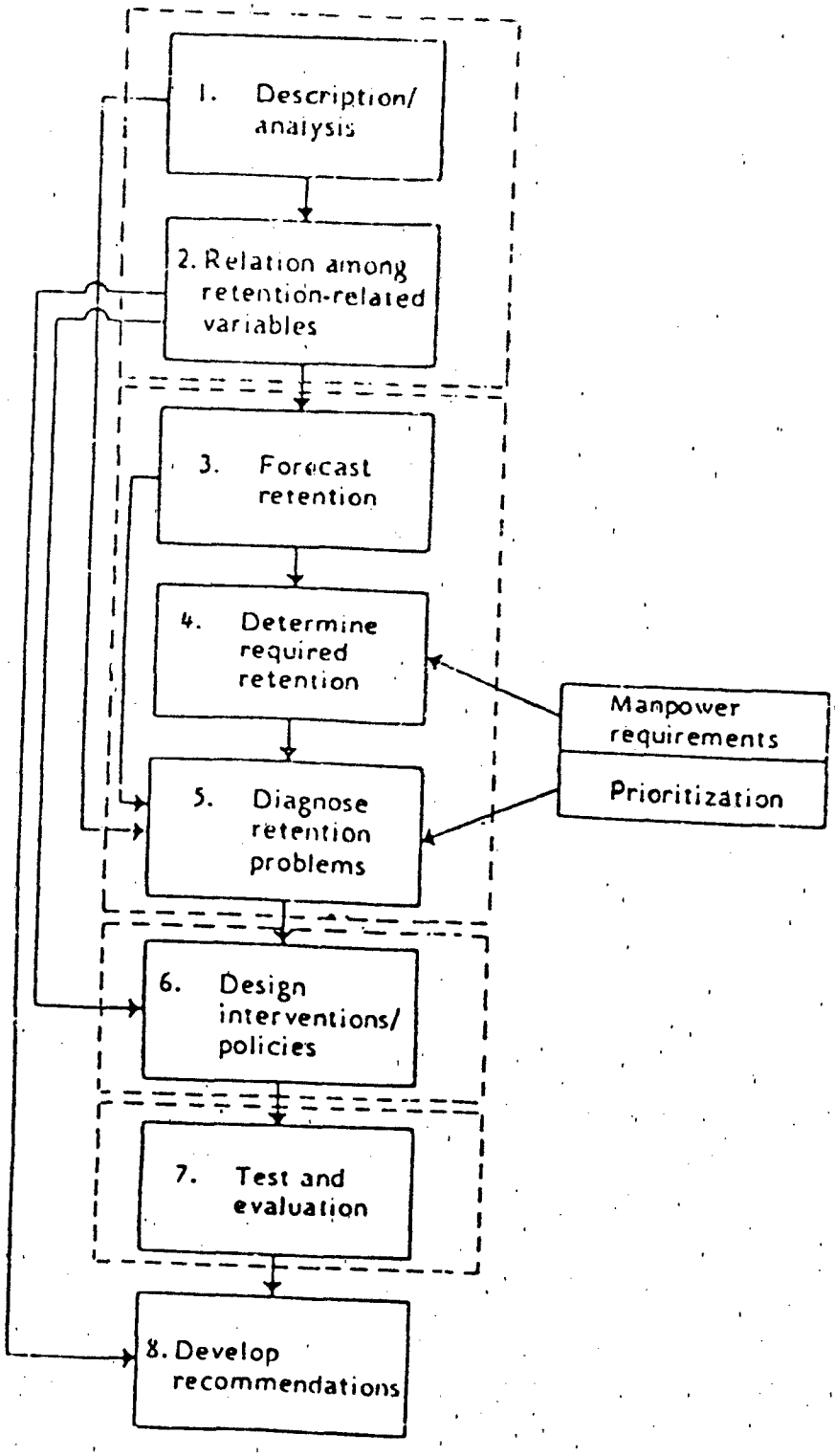

Figure 1. Action steps for retention plan

TRANSITION SOCIALIZATION EFFECTIVENESS IN ORGANIZATIONS

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Overview

This research program deals with the processes via which individuals are successfully (or unsuccessfully) socialized during their transition across various organizational boundaries. Organizations continuously bring in new recruits or employees and move employees to new positions, units, and/or locations. With these transitions comes the need for the individual to learn and adapt to the new role requirements. The organization must provide means for communicating and reinforcing the role requirements and, within limits, adapting to the new member. This learning-communicating-adapting process is what is meant by the socialization process.

To the extent the socialization process is successful, individuals learn their new role, perform effectively in it, and within limits, may even modify the role to the mutual advantage of individual and organization (Van Maanen & Schein, 1979). To the extent the socialization process is not successful, individuals may behave in unacceptable ways, reject the organization and leave, or withdraw psychologically (Wanous, 1980). The lack of effective role behavior and excessive turnover in some organizations may well be linked to inadequacies in the socialization process. While the organizational and behavioral sciences have provided a good foundation for understanding socialization processes in organizations (e.g., Graen, 1976; Katz & Kahn, 1978; Schein, 1978, Van Maanen, 1976; Wanous, 1980), a great deal remains to be learned about such processes (Schein, 1978).

The objective of the present research is to further contribute to the body of knowledge on socialization processes by focusing on transitions, both into the organization and into different positions, units, or locations. In addition to further conceptual development of the transition socialization process, the research seeks to further specify criteria for socialization effectiveness and to identify and evaluate specific strategies an organization can use to facilitate successful transition socialization. Such information should be of value to organizations like the military who are concerned with a diminished pool of recruits, turnover, and ineffective or unacceptably deviant role behavior.

Conceptual Basis

Organizational socialization refers to the processes by which a person learns the values, norms, and required behaviors which permit him to participate as a member of the organization (Van Maanen, 1976, p. 67). Further, organizational socialization may require a person to give up certain attitudes, values, and behaviors as the "price of membership" (Schein, 1968). Although the organizational socialization process is continuous, it is particularly salient during transitions across various

organizational boundaries. The transitions of particular interest here are (1) original entry into the organization and (2) transfer (and/or promotion) to a new position, unit, and/or location.

When individuals cross organizational boundaries, either as new recruits or when transferred to new positions, units, and/or locations, they are confronted with a complex learning situation. Several elements of this learning suggested in the extant literature (see e.g., Graen, 1976; Lieberman, 1956; Moore, 1969; Schein, 1978; Wanous, 1980; Van Maanen, 1976) include:

1. Learning the job-task requirements;
2. Learning to deal with the pattern of interpersonal relations, e.g., boss, peer, subordinates;
3. Learning the formal system, e.g., structure, goals, rewards, formal communication, norms, appropriate values and attitudes;
4. Learning the informal system, e.g., informal communication channels, informal rewards and sanctions, informal social norms, appropriate values and attitudes;
5. Learning the "mundane" aspects of the new role, e.g., where are the restrooms, when is lunch, etc.;
6. Learning to fit the work role into other non-work roles, e.g., parent, leisure roles, community roles, etc.

The present research seeks to focus on how organizations can facilitate this multifaceted adaptation which surrounds movement to a new role.

Several phases in the socialization process may be identified: anticipatory socialization; initial confrontation; accommodation and role management.

Anticipatory socialization refers to the degree to which the individual is prepared, prior to entry, to occupy the role (Porter, Lawler, & Hackman, 1975; Van Maanen, 1976). Individuals do not come to the new role with a "tabula rasa." They come with a set of expectations, values, and abilities that may or may not be appropriate to the new role. One important avenue of research is to attempt to specify with greater precision, where and how individuals develop their expectations about the new role. That is, what are the mechanisms of anticipatory socialization and how may the organization effectively facilitate such socialization prior to the individuals movement into the new role.

Initial confrontation (Graen, 1976) or encounter (Van Maanen, 1976; Porter, et al., 1975) refers to the individual's initial occupancy of the new role, the "reality shock," the beginning to learn and cope with the reality of the new role. The high early attrition in many organizations (Wanous, 1980; Mobley, et al., 1979; U.S. Civil Service Commission, 1977) suggests that the expectations, values, and/or abilities of many individuals are sufficiently discrepant from the reality of the new role that the outcome is turnover. An important avenue of research is to further specify the dynamics of this initial confrontation and seek mechanisms for facilitating positive outcomes.

Accommodation refers to the phase in which the individual begins to gain a deeper understanding of the role, to cognitively and behaviorally adapt to the role requirements. Graen (1976) refers to this phase as the "working through" phase and argues that it may include not only learning, but also "negotiation" between the new incumbent and the organization. Feldman (1976) suggests that in this phase the individual recognizes and

must deal with the issue of role conflict, that is, integrating the work role with various non-work roles and various sources of internal role conflict. Further, this phase may involve alteration of values, e.g., internalization of organizational values, reevaluation of career aspirations, and attempts to change role definition. This phase is probably longer than the preceding phases and in fact may be viewed as ongoing.

It is well to note that these phases can characterize both initial entry into the organization and internal movement to a new position, unit or location.

Although it is premature to specify a detailed conceptual model, Figure 1 presents our preliminary thinking on modeling the transition socialization process. This model attempts to integrate and further specify the work of Schein (1968, 1978), Graen (1976), Horner, et al. (1979), Katz & Kahn (1978), and Van Maanen (1976).

The present research focuses on: how role information is transmitted in each phase, the content and senders of such information; what role information is perceived and how it is interpreted; what individual and organizational variables influence the sending, receiving, and interpretation of role information; how role ambiguity, load, and conflict, discrepant expectations, values, and abilities relate to various role learning mechanisms and to positive and negative outcomes. The ultimate objective is to suggest specific organizational strategies for transmitting role information in transition settings so as to enhance the probability of positive outcomes.

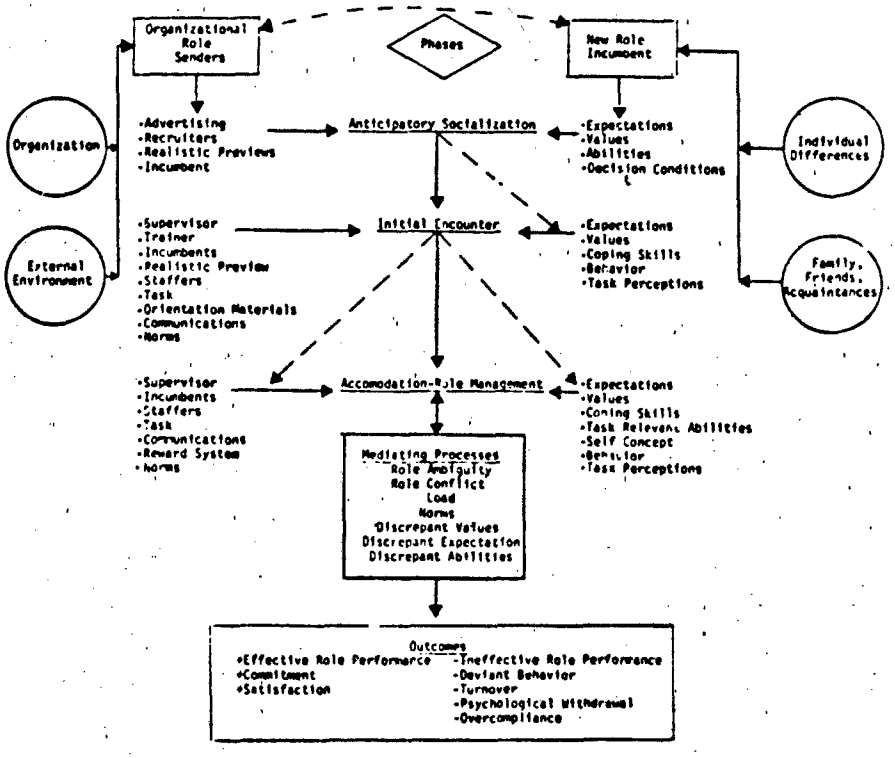

Figure 1. A generalized model of the transition socialization process

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POST-TRAINING ATTRITION IN THE ARMY AND AIR FORCE

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Since the end of the military draft in 1973, the military services have experienced unexpectedly high rates of first-term enlisted attrition. Recent experience has led military planners to expect nearly 40 percent of each accession cohort to leave before the end of their enlistment term. High attrition rates imply increased costs and policy adjustments throughout the military manpower system, and their effects pervade recruiting, training, force readiness and, ultimately, retention policies.

This study examines the relative contributions of various service experiences and individual background characteristics to post-training enlisted male attrition. The analysis is based on the FY75 Cohort File created by the Defense Manpower Data Center, which contains information on nonprior service enlisted accessions for FY1975. The file makes it possible to trace the effects of military experience on attrition behavior throughout the first term of enlistment.

Post-training attrition refers to recruits who complete their advanced individual training in a military occupational specialty but leave the military before the end of their enlistment term. Such attrition is particularly important for two reasons. First, post-training attrition is costly to the services. It costs the services much more to lose a technically qualified specialist than to lose a trainee. Further attrition shrinks the services' pool of specialists; to maintain manning at desired levels, the services may therefore have to devote more time, money, and personnel to recruiting, and often must offer greater enlistment incentives. Second, if the recruit finishes training without either "quitting" or being "fired" by the service, he enters the more steady-state post-training phase, which is more amenable to policy adjustments.

The study uses a multivariate attrition model to describe the effects of individual characteristics and military environment on attrition. The military environment is represented by the recruit's duty location assignments, career turbulence (e.g., job reassignments and retraining), and military occupational assignments. This approach allows us to measure the relative contribution to attrition of a single characteristic, such as military occupation, while simultaneously controlling for other individual characteristics (e.g., education and age), duty location assignments, and career turbulence.

The parameters of the attrition model are estimated for different occupational groups, which consist of similar occupational specialties in the Army and Air Force. This methodology facilitates a comparison of occupational attrition across services. These comparisons involve the

relative contribution of individual characteristics, career turbulence, and duty location to attrition in the same occupational areas of the two services. The relative influences of these variables on attrition are also compared across occupational groups in each service.

RESULTS

In the post-training attrition model, selected variables represent various aspects of individual background experiences. These experiences include the recruit's region of origin, age at entry into the military, educational attainment, race, mental aptitude, and family status (marital status and presence of children). Our analysis of post-training suggests the following:

- Army recruits who enter the service before reaching age 18 have 5 percent to 7 percent higher post-training attrition rates than 18-year-old recruits in most occupational groups. In the Air Force, young recruits are considerably less attrition-prone than their Army counterparts.

- Recruits without high school diplomas are at least 10 percent more likely to discharge early than high school graduates in all occupational areas of the Army and Air Force.

- Attrition rates do not vary significantly with race in most occupational areas of the Army and Air Force. Blacks, however, are about 4 percent less likely than whites to leave early from Army combat areas.

- When other individual characteristics are held constant, mental test category is generally not a significant determinant of the relative level of attrition. In Army combat arms, however, lower-category recruits have a higher attrition level than recruits in high categories.

- Married recruits are 3 to 8 percent less likely than single recruits to leave before the end of their enlistment term. The inhibiting influence of marriage on attrition is largely offset if the recruit is a parent, however.

These results indicate that individual background characteristics are highly correlated with relative post-training attrition in the Army and Air Force.

In general, individual characteristics tend to have consistent qualitative and quantitative implications for attrition in virtually all occupational groups in both services. Although the level of attrition varies substantially across occupational groups and services, the relative contribution of a given characteristic, e.g., educational attainment, to the attrition level remains consistent. This implies that overall attrition cannot be attenuated by reassigning recruits with certain characteristics to occupations where these attributes less posi-

tively affect attrition. For instance, if we found that high school graduates had relatively high post-training attrition rates (as compared with nongraduates) in maintenance specialties but low rates in supply specialties, it might seem plausible to channel more graduates into supply as a way to reduce overall post-training attrition. Our results suggest, however, that such reassignment will not affect the aggregate level of attrition.

Another aspect of the recruit's pre-service experiences is represented by his entry status at accession, which includes his term of enlistment and participation in a delayed entry program (DEP). DEP is a common military enlistment program that allows a recruit to wait up to 12 months after enlistment before entering active duty. DEP participants have a 5 to 10 percent lower attrition probability than nonparticipants, depending on their occupational assignment. Four-year enlistees are significantly more likely to discharge early than three-year enlistees.

Post-training attrition rates vary significantly with duty location, after controlling for individual characteristics, career turbulence, and occupation. Air Force assignments in Europe and the Pacific are associated with lower attrition rates in all occupational areas; the size of the influence ranges from 8 to 27 percent. While duty location has a significant effect on Army attrition, the effect is not systematic across occupational groups. These results suggest that the environmental, vocational, and command factors associated with a duty assignment are important determinants of the overall attrition level.

In both the Army and Air Force, attrition levels vary significantly both across occupational groups and across occupational specialties within most groups, after controlling for individual characteristics, career turbulence, and duty assignments. In some occupational groups, such as combat arms, the differences in relative attrition level among occupational specialties are not statistically significant. The observed, unconditional differences in attrition by occupation within these job groups are primarily attributable to differences in background characteristics and duty locations of individuals in these jobs. Thus, a recruit's specific job assignment in the combat group has no statistically significant influence on his attrition probability. In most other job groups, however, the experiences associated with a specific occupational assignment will significantly influence the likelihood of a recruit's completing his enlistment term.

POLICY IMPLICATIONS

The results have four implications for policymakers. First, as mentioned above, it does not appear possible to reduce attrition appreciably by reshuffling recruits' assignments in hopes of dampening the effects of individual characteristics; those effects persist regardless. Second, the observed relationship between individual characteristics and

post-training attrition indicates that more stringent accession screens could reduce the overall attrition level, but that the costs of more intensive recruiting and screening, and of added enlistment incentives, may be prohibitively high. Third, because attrition varies by duty location, it may be possible to reduce attrition rates by changing personnel practices to encourage recruits to remain in less popular locations. Finally, because attrition also varies by occupation, it may be possible to reduce the overall attrition level by either altering the mix of military occupations held by new recruits or enhancing the attractiveness of high-attrition occupations.

These results suggest that it would be useful to conduct a more detailed inquiry into the factors that precipitate unusually high (or low) attrition levels in different locations and occupations. To the extent that attrition differences are related to military programs and environments, attrition management policies could be designed to replicate desirable factors and reduce overall attrition levels.

ARMY MALE AND FEMALE ATTRITION

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The purpose of this paper is to describe results of recent Army Research Institute (ARI) research on male and female attrition, and to discuss one ongoing research project. These efforts have been undertaken as part of the overall ARI research program on soldier recruiting and retention in support of the Army Deputy Chief of Staff for Personnel (DCSPER) community. Research products from the program are designed to provide both DCSPER policy makers and unit commanders in the field with information and techniques to enhance soldier recruiting and aid in soldier retention.

One of the most difficult challenges facing the modern Volunteer Army is recruiting and retaining qualified personnel (c.f., Meyer, 1980). This is all the more difficult in the face of a shrinking population from which the majority of soldiers have traditionally been recruited--the 17 to 20 year old males. As the recruitment of males becomes more difficult, it has been assumed that more females could be recruited in order to fulfill the total enlisted force goals. It would appear that recruiting to attain a force of more females to make up for a potential shortfall of males is a definite possibility. However, high attrition of male and even higher attrition of female recruits may make maintaining a stable force very difficult. For the Fiscal Year 1980 cohort group, the Army estimates that 34.1% of the first term enlisted males and 48.5% of enlisted females will be discharged before completion of their enlistment (This is Your Army, 1981).

In addition to adversely affecting force stability, attrition--whether from male or female losses--is costly to the Army. Some of these costs are incurred by any recruit: recruiting, in-processing, and training. Additional costs specific to attritees are: replacement recruiting, replacement training, in-processing, and attritee out-processing. In addition, personnel turbulence may affect unit readiness and unit effectiveness. Consequently, the Army is interested in understanding the dynamics of enlisted attrition to reduce the attrition of qualified male and female personnel.

The two research efforts described in this paper have the following objectives:

PROJECT I: To determine whether attrition rates differed by (1) soldier gender, (2) traditionality of Military Occupational Specialty (MOS), (3) soldier characteristics, and (4) type of discharge action. The description of this Project is based, in part, on a draft Army Research Institute (ARI) Technical Report by Ross, R.M., Nogami, G.Y., and Eaton, N.K. The Technical Report is scheduled for release in FY 82.

PROJECT II: To identify potential causes of attrition of personnel in units based on (1) enlistee characteristics, (2) MOS characteristics, and (3) location of assignment. This project will be described in detail in an ARI Technical Report by Nogami, G.Y., Eaton, N.K., Ross, R.M., and Tremble, T.R.

Project I

The first project dealt with an analysis of historical data from the 1976 cohort of Army enlistees. The data base was comprised of all FY 1976 nonprior service, 3-4 year female enlistees, and 10% of all FY 1976 nonprior service, 3-4 year male enlistees. Male enlistees were selected on the basis of the last digit of their social security number. The data were extracted from the Defense Manpower Data Center (DMDC) 1976 Enlisted Cohort Data Base. The total sample for the analyses was 31,931; 16,228 males (10% of DMDC File) and 15,703 females. This reflected the Army gender proportions of the DMDC report #968 (March, 1980) of FY 1976 entrants: 163,009 males and 15,790 females. The data base is accurate to 30 September 1979. Four year enlistees who entered from 1 October 1975 to 30 June 1976 would not have separated from the service or completed their first term of enlistment by the September date. Consequently, there were incomplete data on character of service, separation codes, separation month and year, and eligibility to reenlist for those four-year enlistees. Data for completion of the first thirty-six months of service for both three and four year enlistees were evaluated. Four year enlistees still in the Army as of 30 September 1979 had completed at least 36 months of service and were considered non-attritees.

Personnel identified as having an ethnic background of non-black non-white "Other" (680), personnel who had been separated but did not have a codeable separation category (458), and all MOS with less than 10 males and 10 females (to include all Combat Arms MOS which were not available to females) (10,350) were eliminated from the data base. This left a total sample of 20,443 soldiers - 7,881 males and 12,562 females.

Variables

Traditionality - The Deputy Chief of Staff for Personnel (DCSPER) definitions of traditional female, less-traditional female, and non-traditional female Career Management Fields (CMF) were used. The only exception was in CMF 31. MOS 36C and 36K were classified as non-traditional; all other MOS in CMF 31 were grouped in the traditional category.

Gender - Male/Female

Race - White/Black

Education - High School Diploma Graduates/non-High School Diploma Graduates and GED

Armed Forces Qualification Test (AFQT) - Score (99th-65th percentile: Cat I, II)/(64th-16th percentile: Cat III, IV)

Age - 17-19 years old/20 years old and older

Type of Discharge Action: (1) Training Discharge (TDP), (2) Expeditious Discharge (EDP), (3) Medical Discharge, (4) Pregnancy, (5) Family Related Discharges, (6) Adverse Discharges, (7) Other Non-Adverse Discharges, (8) End of Tour of Service (ETS), and (9) Reenlistment.

Analyses

Two types of statistical tests were used to analyse the data: (1) multi-dimensional chi-square and (2) analysis of variance. The multi-dimensional chi-square analyses compared all individuals within a traditionality category with all other individuals in other traditionality categories. The analyses of variance compared MOS attrition rates within a category to other MOS attrition rates in other categories. As such, the analysis of variance techniques emphasized the dispersion of different MOS attrition rates.

Results and Conclusions

The MOS job traditionality data were analyzed with multi-dimensional chi-square and analysis of variance techniques (see Table 1). The multi-dimensional chi-square analysis showed that MOS job traditionality has a moderate effect on female attrition rates. Overall female attrition was lowest in the traditional female MOS category, intermediate in the less traditional, and highest in the non-traditional female MOS category. For males, traditionality of MOS categories appeared to have no effect. In contrast to the chi-square analysis, the analysis of variance for job traditionality and gender was non-significant even though the percent/proportion differences between males and females was as large as, or larger, than the differences in the chi-square analysis.

TABLE 1

Multi-dimensional Chi-Square Analysis

Gender X Traditionality
$p < .0000$

	Male	Female	Difference
Traditional	.34[1]	.37	+.03
Less Traditional	.35	.43	+.08
Non Traditional	.35	.46	+.11

Analysis of Variance

Gender X Traditionality
$p = .18$

Not significant	Male	Female	Difference
Traditional	.28	.36	+.08
Less Traditional	.35	.41	+.06
Non Traditional	.31	.45	+.14

[1] Proportion of attrition to non-attrition. Can be directly translated to percent attrition.

This points up an important feature of the data--the wide variation of attrition rates for males and females within and between MOS in the same traditionality category. For example, within traditional female MOS male attrition rates varied from 4.8% to 50.0% while female attrition rates varied from 17.50% to 55.1%. Male and female attrition rates, by MOS, are shown in Tables 2-7. This wide variation of MOS attrition rates within a

TABLE 2

COMPARISON OF MALE AND FEMALE ATTRITION FOR SELECTED PMOS

TRADITIONAL - HIGH FEMALE FILL

PMOS[1]	(Σn)MALE[2]	(Σn)FEMALE[2]	% MALE ATTRITION	% FEMALE ATTRITION	DIFFERENCE[3]	NON-PREG ATTRITION[5]	DIFFERENCE[6]
*05C	214	168	38.8	45.2	6.4[4]	40.3	1.5
31M	174	251	36.2	45.4	9.2	39.1	2.9
*71L	338	1697	32.7	36.8	4.1	30.5	-2.2
71M	29	243	24.1	36.6	12.5	29.4	5.3
72E	183	824	33.3	41.7	8.4	35.0	1.7
73C	58	448	12.1	30.4	18.3	23.2	11.1
75B	87	378	43.7	40.2	-3.5	32.9	-10.8
75C	29	181	34.5	34.3	-0.2	25.6	-8.9
75D	54	173	35.2	34.1	-1.1	28.3	-6.9
75E	15	127	33.3	52.0	18.7	46.0	12.7
91B	559	237	36.1	38.4	2.3	29.8	-6.3
91C	29	234	6.9	23.1	16.2	17.4	10.5
91E	20	127	10.0	29.1	19.1	22.4	12.4
92B	27	108	14.8	25.0	10.2	20.6	5.8

* grouping includes some discontinued MOS
05C = 05C + 05F
71L = 71L + 71B + 71F

[1]The PMOS listed is the enlistee's PMOS at time of separation.

[2](Σn) Males and (Σn)Females is the total number of males and females who had these PMOS at time of separation. These numbers and all analyses include only "Black" and "White" racial categories. Data for the racial and ethnic designator "Other" was not included in the analyses.

[3]This column (column 6) tabulates the difference between % total male attrition (column 4) and % total female attrition (column 5).

[4]A positive difference indicates a higher female attrition rate; a negative number = a higher male attrition rate.

[5]Non-pregnancy attrition refers to the percent of female attrition which is attributable to all causes except pregnancy. Medical discharges -- other than pregnancy -- are included in this tabulation.

[6]The percentages reported in this column are the differences between % total male attrition (column 4) and % non-pregnancy female attrition (column 7).

TABLE 3

COMPARISON OF MALE AND FEMALE ATTRITION FOR SELECTED PMOS

TRADITIONAL - LOW FEMALE FILL

PMOS[1]	(Σ n)MALE	(Σ n)FEMALE	% MALE ATTRITION	% FEMALE ATTRITION	DIFFERENCE	NON-PREG ATTRITION	DIFFERENCE
03C	11	15	18.2	40.0	21.8	35.7	17.5
05B	129	67	40.3	47.8	7.5	39.7	-0.6
26Q	21	57	4.8	17.5	12.7	2.1	-2.7
31N	14	69	50.0	55.1	5.1	49.2	-0.8
31V	104	70	42.3	37.1	-5.2	35.3	-7.0
32D	18	29	27.8	37.9	10.1	28.0	0.2
71D	19	95	10.5	38.9	28.4	31.0	20.5
71G	18	29	27.8	27.6	-0.2	22.2	-5.6
91D	27	56	29.6	26.8	-2.8	22.6	-7.0
91P	10	49	10.0	36.7	26.7	32.6	22.6
91R	14	96	50.0	28.1	-21.9	21.6	-28.4
91T	11	11	27.3	18.2	-9.1	10.0	-17.3

[1] grouping includes some discontinued MOS
05B = 05B + 05E
31V = 31V + 31B

TABLE 4

COMPARISON OF MALE AND FEMALE ATTRITION FOR SELECTED PMOS

LESS TRADITIONAL - HIGH FEMALE FILL

PMOS	(Σ n)MALE	(Σ n)FEMALE	% MALE ATTRITION	% FEMALE ATTRITION	DIFFERENCE	NON-PREG ATTRITION	DIFFERENCE
76D	291	288	27.8	33.3	5.5	25.9	-1.9
76Y	293	362	34.8	34.0	-0.8	27.8	-7.0
94B	469	1431	47.8	48.5	0.7	41.6	-6.2
95B	539	610	24.5	42.0	17.5	35.8	11.3
96B	24	123	29.2	38.2	9.0	32.1	2.9
98G	59	118	11.9	32.2	20.3	16.7	4.8

TABLE 5

COMPARISON OF MALE AND FEMALE ATTRITION FOR SELECTED PMOS

LESS-TRADITIONAL - LOW FEMALE FILL

PMOS	(Σn)MALE	(Σn)FEMALE	% MALE ATTRITION	% FEMALE ATTRITION	DIFFERENCE	NON-PREG ATTRITION	DIFFERENCE
43E	35	51	42.9	64.7	21.8	63.3	20.4
57E	36	15	44.4	60.0	15.6	53.8	9.4
74D	10	47	20.0	8.5	-11.5	6.5	-13.5
76J	10	59	40.0	33.9	-6.1	31.6	-8.4
76P	53	66	64.2	47.0	-17.2	37.5	-26.7
76V	48	52	41.7	38.5	-3.2	30.4	-11.3
95C	63	67	27.0	47.8	20.8	38.6	11.6

TABLE 6

COMPARISON OF MALE AND FEMALE ATTRITION FOR SELECTED PMOS

NON-TRADITIONAL - HIGH FEMALE FILL

PMOS[1]	(Σn)MALES	(Σn)FEMALES	% MALE ATTRITION	% FEMALE ATTRITION	DIFFERENCE	NON-PREG ATTRITION	DIFFERENCE
31J	33	156	12.1	46.6	34.7	40.7	28.6
36C	218	201	39.9	51.7	11.8	46.4	6.5
55B	61	195	42.6	43.1	0.5	38.7	-3.9
63B	638	223	40.1	54.3	14.2	48.2	8.1
63H	174	102	28.7	50.0	21.3	39.3	10.6
64C	549	902	36.6	50.2	13.6	43.4	6.8
67N	62	105	24.2	27.6	3.4	20.0	-4.2
71N	27	115	25.9	34.8	8.9	28.6	2.7

[1]grouping includes some discontinued MOS
36C = 36C + 72C
63B = 63B + 52B

TABLE 7

COMPARISON OF MALE AND FEMALE ATTRITION FOR SELECTED MOS

NON-TRADITIONAL - LOW FEMALE FILL

MOS[1]	(Σn) MALE	(Σn) FEMALE	% MALE ATTRITION	% FEMALE ATTRITION	DIFFERENCE	NON-PREG ATTRITION	DIFFERENCE
05H	35	96	22.9	45.8	22.9	41.6	18.7
05K	11	28	36.4	14.3	-22.1	7.7	-28.7
26L	18	75	55.6	77.3	21.7	73.8	18.2
26V	14	68	50.0	63.2	13.2	60.3	10.3
31E	20	35	30.0	54.3	24.3	48.4	18.4
31S	14	29	21.4	34.5	13.1	26.9	5.5
35E	12	35	50.0	48.6	-1.4	43.8	-6.2
35K	16	21	31.3	61.9	30.6	55.6	24.3
36H	17	50	23.5	38.0	14.5	31.1	7.6
36K	473	82	44.0	46.3	2.3	38.0	-6.0
44B	29	33	34.5	46.2	11.7	30.0	-4.5
45B	16	17	18.8	58.8	40.0	53.3	34.5
45K	30	55	36.7	41.8	5.1	37.3	0.6
45L	24	15	45.8	20.0	-25.8	14.3	-31.5
51B	115	53	13.0	37.7	24.7	28.3	15.3
51N	55	16	40.0	43.8	3.8	40.0	0.0
51R	28	14	42.9	78.6	35.7	76.9	34.0
52D	81	61	9.9	27.9	18.0	22.8	12.9
54E	18	20	38.9	20.0	-18.9	11.1	-27.8
57H	37	16	54.1	50.0	-4.1	46.7	-7.4
61B	40	37	30.0	67.6	37.6	60.0	30.0
62B	147	20	34.7	55.0	20.3	47.1	12.4
62F	63	55	33.3	52.7	19.4	48.0	14.7
62J	29	15	37.9	73.3	35.4	66.7	28.8

[1] group includes some discontinued MOS
36H = 36H + 36G
51N = 51N + 51K
62F = 62F + 62P + 62M

TABLE 7 (Cont)

NON-TRADITIONAL - LOW FEMALE FILL

POS[1]	(Σn)MALE	(Σn)FEMALE	% MALE ATTRITION	% FEMALE ATTRITION	DIFFERENCE	NON-PREG ATTRITION	DIFFERENCE
63C	206	52	33.0	51.9	18.9	44.4	11.4
63F	105	35	38.1	54.3	16.2	52.9	14.8
63G	31	22	35.5	54.5	19.0	47.4	11.9
63J	29	20	41.4	25.0	-16.4	16.7	-24.7
67G	12	13	8.3	46.2	37.9	36.4	28.1
67U	14	16	14.3	43.8	29.5	30.8	16.5
67V	56	32	23.2	38.9	15.7	31.3	8.1
68G	32	22	21.9	40.9	19.0	31.6	9.7
71P	32	42	21.9	23.8	1.9	15.8	-6.1
76W	52	55	28.8	43.6	14.8	36.7	7,9
81C	10	16	10.0	18.8	8.8	13.3	3.3
93H	15	85	20.0	36.5	16.5	33.3	13.3
93J	20	59	30.0	39.0	9.0	32.1	2.1
98C	21	46	19.0	13.0	-6.0	9.1	-9.9

traditionality category led to non-significance by an analysis of variance technique even though the average differences between traditionality categories was large. The data indicate that although MOS job traditionality may be useful as a variable, one must consider the attrition rate of individual MOS's within each traditionality category in understanding attrition.

The variables of race, education, and AFQT were included in the overall multi-dimensional chi-square analysis used to evaluate gender and traditionality. Education, race, and AFQT related strongly to attrition; higher rates of attrition occur for (1) the non-high school diploma graduates (including GEDs) than high school diploma graduates, (2) whites than blacks, and (3) Category III and IV than Category I and II. It is important to note that there were several two-way interactions in these data (shown in Table 8). These interactions indicate that differences in attrition rates related to one variable (such as education) are not constant when a second variable (such as gender) is considered. In the data the overall difference between

TABLE 6

ATTRITION RATES FOR
EDUCATION x GENDER, RACE x GENDER
AND RACE x EDUCATION

EDUCATION x GENDER

		MALE	FEMALE	
EDUCATION	HSDG	.23 (4,428)	.39 (11,177)	.35 (15,605)
	NHSDG	.50 (3,453)	.56 (1,385)	.52 (4,838)
		.35 (7,881)	.41 (12,562)	

RACE x GENDER

		MALE	FEMALE	
RACE	BLACK	.33 (2,237)	.28 (2,430)	.31 (4,667)
	WHITE	.35 (5,644)	.44 (10,132)	.41 (15,776)
		.35 (7,881)	.41 (12,567)	

RACE x EDUCATION

		HSDG	NHSDG	
RACE	BLACK	.26 (3,616)	.48 (1,051)	.31 (4,667)
	WHITE	.37 (11,989)	.53 (3,787)	.41 (15,776)
		.35 (15,605)	.52 (4,838)	

AFQT x GENDER

		MALE	FEMALE	
AFQT	(Cat. I, II)	.27 (2,285)	.40 (9,051)	.37 (11,336)
	(Cat. III, IV)	.38 (5,596)	.44 (3,511)	.40 (9,107)
		.35 (7,881)	.41 (12,562)	

male and female attrition rates for Education X Gender was .06 (.35 - .41). But this difference was not constant for males and females at the two education levels. Graduate men and women differed by .16 (.23 - .39) while non-graduates differed by only .06 (.50 - .56).

It is important to note that there were no three way or higher interactions. Consequently the data presented in Table 8, as well as the Gender X Traditionality data presented previously, may be interpreted without concern for the effects of other variables in our analyses but not shown in the two-way tables. For example, one need not consider whether education, race, or AFQT impacted on the Gender X Traditionality results, because those 3 variables did not enter into an interaction with Gender X Traditionality.

Males and females attrited for different reasons. More females than males attrited due to family related causes and pregnancy (9% and 25% differences, respectively). Male attrition was higher for TDP (8%), EDP (5%), Medical (6%) and Adverse causes (15%). There was no difference between male and female attrition due to "other" non-adverse causes. These data are shown in Table 9.

TABLE 9

Attrition Rates for Each Separation Category

	TDP	EDP	Medical	Pregnancy	Adverse	Other Non-Adverse	Family Related	
Gender								
Male	.33(910)[1]	.25(676)	.13(759)	.00(0)	.24(651)	.02(43)	.03(83)	1.00(2722)
Female	.25(1317)	.20(1010)	.07(359)	.25(1283)	.09(472)	.02(90)	.12(646)	1.00(5177)
	.28(2227)	.21(1686)	.09(718)	.16(1283)	.14(1123)	.02(133)	.09(729)	.99(7899)
Differences[2]	-.08	-.05	-.06	.25	-.15	.00	.09	

[1].33(910) to be read 33% of all male attrition can be attributed to TDPs, n=910.

[2]Positive differences denote a higher percent of female attrition than male attrition in that separation category.

Caution to the Reader

Several factors should be considered before generalizing from these data to the population of females and males in the Army today. These include rules and regulations which have changed since 1976, and specific characteristics of this data base. First, in 1976 all females entering the Army had to have a high school degree or GED equivalent, and have scored above 59 on the Armed Forces Qualification Test. For males there was no high school degree requirement in 1976. In 1979, requirements for females were changed and are now more like male requirements. Second, until 1979 the U.S. Government paid for all abortions for service members. It is unknown what effect that may have on attrition (pregnancy discharges), but an increase of some size would be expected.

Project II

The second project dealt with first tour soldiers in units, and their non-commissioned and commissioned officer supervisors. The primary data for this project were collected by ARI researchers in the field using questionnaires and structured interviews. These were designed to provide data to determine how attrition varies as a function of the characteristics of the enlistee, the MOS, and the location of assignment.

Research Participants

Approximately 2,200 soldiers are participating in this research effort, 1,100 in the United States, and 1,100 in the Federal Republic of Germany. These include 1,000 enlisted men and 600 enlisted women on their first tour, 200 supervisors, and 400 first tour soldiers awaiting early discharge.

Variables

The major variable categories in this effort are listed below, with samples of types of items addressed within each category.

1. Demographics
   - A. Sex
   - B. Education
   - C. Current rank
   - D. Race
   - E. Time in the Army
   - F. Term of enlistment
   - G. Marital status/parenthood
2. Reasons for Enlisting/Expectations
   - A. Because the Army takes care of its soldiers
   - B. To get a steady job
   - C. To get away from home
   - D. To serve the country
   - E. To learn a skill
3. Work Environment
   - A. Duty time involving heavy physical labor
   - B. Desirability of heavy physical labor
   - C. Duty time spent outdoors
   - D. Desirability of working outdoors
   - E. Compatability with the other soldiers in the unit
4. Off-Duty Environment
   - A. Time to take care of personal and family needs
   - B. Pressures of the job which impact on off-duty life
   - C. Desirability of living in the area where stationed
   - D. Facilities checklist
   - E. Amount of off-duty time

5. MOS (Job) Characteristics

   A. Working in my primary MOS
   B. Interesting job
   C. Promotion opportunities
   D. BCT and AIT preparation for job

6. Civilian Opportunities (Environmental Push/Pull)

   A. More money outside the Army
   B. Learning skills that will help prepare for a job outside the Army
   C. Ability to obtain a good job outside the Army now
   D. Anticipated living conditions outside the Army

7. Availability of Facilities

   A. On-post

      (1) Enlisted club
      (2) Photo lab
      (3) Auto repair shop
      (4) Movie theater

   B. Off-post

      (1) Discos
      (2) Local bars
      (3) Gymnasiums
      (4) Restaurants

8. Location of Assignment

   A. U.S. vs Germany
   B. Well liked vs less liked location

Status of Project

Data were collected in the United States during May and June 1981, and in Germany during July and August 1981. An initial fact sheet on results is projected for November 1981 with a draft ARI Technical Report projected for FY 82.

Summary

The Army Research Institute is currently executing a research program on enlisted soldier recruiting and retention in support of the DCSPER community and unit commanders in the field. One of the first two research efforts on soldier retention has been completed, and a second is ongoing with projected completion in early 1982. The first effort produced results showing soldier attrition rates as a function of soldier sex, race, age, AFQT score, education, MOS, and their interactions. The second effort will identify potential causes of soldier attrition in units, based on soldier characteristics, job characteristics, and assignment location. Together these data will support the DCSPER and field commanders in developing policy decisions and unit-oriented techniques for attrition reduction. The effectiveness of these decisions and techniques will be evaluated in future research efforts, providing the Army with data-based policy decisions and field-validated techniques for enhanced retention of enlisted soldiers.

INVOLUNTARY ATTRITION: PREDICTIONS FOR NON-HIGH SCHOOL GRADUATE ARMY ENLISTEES

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Background

Recent presidential and congressional decisions designed to revitalize the selective service system underscore the necessity for strengthening the United States' capacity for rapid manpower mobilization in time of emergency. In part, these decisions were made in response to a series of recent world events which served to focus public and military policy making attention on the issue of military preparedness. Underscoring this larger concern, however, is the issue of the manpower trends which have developed in the recruiting and retention of military enlistees since the inception of the All Volunteer Force in 1973.

The ability of the Department of Defense in general and the Army in particular to recruit, select, and retain adequate members in the active enlisted force of the 1980's and 1990's constitutes a significant political, economic and social issue. Since the All Volunteer Force began, a variety of viewpoints have been expressed as to how well the program has performed. Summarizing recruiting and retention efforts in 1977, Cooper (1977) builds a case for success, arguing that the military services can attract the desired quantity and quality of new recruits at a cost substantially lower than commonly assumed. Moreover, he argues that existing levels of attrition among enlistees may be due to overly stringent requirements with respect to education levels and aptitude scores. In contrast, a more recent review by Janowitz and Moskos (1979) suggests that the "all-volunteer force is smaller, more expensive, [and] of lower quality in selected but crucial segments... than...anticipated", and that "the capacity of the armed services to meet their numerical goals has in large part been the result of a downward recasting of manpower objectives" (p. 177).

Although the reports by Cooper, and Janowitz and Moskos suggest many areas of controversy surrounding the All Volunteer Force program, there appears to be some agreement that attrition rates among AVF enlistees are cause for concern. Since the inception of the AVF, approximately one third of all non-prior service male enlisted accessions have been involuntarily discharged before completion of three years of service, (DoD, 1980). This is costly to the national defense in terms of direct costs as well as the indirect costs of unit turbulence, lower morale and decreased readiness.

A good deal of attention has recently been directed toward the problem of enlisted attrition (e.g., Goodstadt & Glickman, 1975; Sinaiko, 1977). Although the research to date shows that the single best predictor of early turnover is the absence of a high school diploma, there is a lack of published empirical work which focuses on whether differences in attrition

risk can be identified within the non-high school diploma group. That is, the non-prior service, non-high school graduate group appears to have been treated by researchers and policy makers alike as a comparatively homogeneous segment with respect to attrition risk. Several factors point to the need for more research on whether such an implicit assumption is justified. First, "selection ratios" (the number of openings relative to the number of applicants) faced by recruiters are becoming increasingly disadvantageous. For example, the number of men in the 19-21 year age group, which has historically been the prime candidate recruiting pool for the military, will decline by an estimated 17% in the 1980-1990 period (DoD, 1978). Second, while substitution of women enlistees and contracted civilians has precluded shortfalls in certain specialties, the rate of substitution is likely to slow in the future. Moreover, substitution is at present proscribed for positions in the combat arms where some of the largest manpower shortfalls are emerging. Finally, and most importantly from the perspective of the present research, recruiting solely from the prime high school graduate male market segment has proven insufficient to meet manpower targets, especially for the Army. In FY 1979, 36% of non-prior service accessions in the Army were drawn from the non-high school graduate population (DoD, 1980).

The above factors converge to indicate that future pressures may be even greater than at present to recruit from less-than-prime candidate pools. At the same time, however, recent policy directives indicate that recruiting from the non-high school graduate market will become an increasingly less permissible means of filling potential shortfalls in the high school graduate group (DoD, 1981). Together, these developments point to the need for more effective selection within the less-than-prime candidate pool.

In view of this situation, the specific objectives of the present research were twofold. First, we sought to develop an actuarial regression model designed to assess the relative risks of attrition among non-high school graduate Army enlistees. As a group, these individuals historically have experienced about twice the attrition rate of their high school graduate counterparts.

Second, we evaluated the advantage of such a multivariable model over using individual scores on the Armed Forces Qualifications Test (AFQT) as a basis for selection within the non-high school graduate population. The AFQT measures arithmetic reasoning, word knowledge and space perception and has historically been used as a determinant of eligibility to enlist.

For model building and evaluation purposes, the investigation relied solely on individual/demographic information that the Army presently collects routinely from recruits. It is noted that recent streams of research involving turnover in selected military segments have made a strong case for the need to consider non-demographic variables in attempts to predict attrition (e.g., Hand, Griffeth, & Mobley, 1977; Hom, Katerberg, & Hulin, 1979; Mobley, Hand, Baker, & Meglino, 1979). Unfortunately, however, such information is typically neither collected nor used as part of the selection process. Nor is there presently evidence that such information is likely to be systematically integrated into the enlistment process in the near future. Thus, given that our initial concern was to gain a better understanding of

the relationship between information presently available to recruiters and subsequent involuntary attrition among non-high school graduate, non-prior service Army enlistees, our model building efforts were limited to the variables described below.

Method

Individuals selected for the study represented all non-high school graduate males who enlisted in the Army from 1974 to 1976. The total population usable for statistical purposes in this period was 178,380 (66,902 for 1974; 53,574 for 1975; 57,904 for 1976).

The 1974-1976 groups were chosen for two reasons. First, the 1974 group represented the first full year of All Volunteer experience and as such there were no draftees in the group. Second, there was sufficient time during this interval for attrition statistics to develop and for all turnover cases up to 1976 to have been officially processed and assigned Interservice Separation Codes indicative of involuntary attrition.

Involuntary attrition was defined as being released from active service prior to the end of a first enlistment tour because of failure to meet minimum behavioral or performance criteria (as more specifically defined by the particular Interservice Separation Code assigned to each individual). Individuals who were separated for such reasons accounted for 51.4% of the 1974 group, 48.8% of the 1975 group, and 38.82 of the 1976 group. While these figures may imply a reduction in attrition over the time periods in question, it should be noted that relative to those enlisting in 1974 or 1975, at the time the data were made available, fewer of the 1976 enlistees had reached the end of their first term enlistment obligation; therefore, the 1976 figure is probably somewhat understated.

At the time of enlistment screening the following data were obtained for each individual in the normal course of applicant processing: (a) census region, (b) age, (c) highest year of education completed, (d) sex, (e) race, (f) Armed Forces Qualification Test Group (AFQTG), (g) month entered, and (h) marital status.

A chi square analysis was performed in order to determine which variables were associated with attrition. This information was used to derive the particular variables which were to be included in the model. These variables and their methods of coding were as follows: (1) race (two categories): caucasian, non-caucasian; (2) highest year of education (two categories); less than or equal to two years of high school, three or four years of high school with no diploma; (3) month entered (two categories): January-June, July-December; (4) age (four categories): 17, 18, 19, or 20 & 21 years: (5) census region (ten categories); (6) AFQTG (four categories, from lowest to highest performance): IVa, IIIb, IIIa, or I & II.

Model

The predictive model was constructed using the 1974 and 1975 populations, and the 1976 data were held-out for subsequent use in cross-validating the

initial model. Several issues were confronted during the model building process. First, although the scale of measurement of the entrants' attributes differs (for example, census region is nominal and AFQTC is ordinal), all of these variables were treated as if they were nominal. This has the advantage of reflecting the effect of the specific attribute directly as the estimated coefficient in the regression model. Second, it was decided to apply the model to grouped data by matching and then aggregating subjects who possed identical profiles on the set of nominal variables. Owing to the large number of individual observations, grouping observations in this way yielded marked computational advantages and was thought unlikely to bias parameter estimates (Haitovsky, 1973). However, since grouping would produce a non-constant variance in the error term due to differences in the number of individuals represented in each resultant cell, a transformation described by Pindyck and Rubinfeld (1976) was used to weight cells with greater observations more heavily and thus improve efficiency of the estimates within the regression model.

It should be noted that alternative model forms to that of the linear function presented here were also considered. For example, a logistic function was also applied to the data. With respect to the significance or non-significance of individual predictor variables, the linear and logistic forms yielded the same outcomes. Therefore, results of the linear model are presented here because, unlike the logistic form, the linear coefficients can be interpreted directly as indices of probability within the present data.

Results

Phase One

Table 1 shows results for the actuarial regression model that was constructed from the 1974 and 1975 data. This model estimates the probabil-

TABLE 1

Actuarial Regression Results

Variable	Beta Coefficient	T-value
Reference profile (constant)	.42	38.12*
Race (non-caucasian)	-.01	- 1.10
3-4 years of high school but no diploma	.08	22.04*
July-December entry	-.01	- 2.31
Age = 17	-.04	- 9.94*
Age = 19	.01	2.52
Age = 20	.00	.00
Census region:		
Mid Atlantic	.00	.00
E. North Central	.00	.00
W. North Central	.00	.00
South Atlantic	.02	1.98
E. South Central	.00	.00
W. South Central	.01	1.27
Mountain	.05	4.19*
Pacific	.01	.51
Other	18	9.82*
AFQTC IIIb	.03	4.76*
AFQTC IIIa	.06	9.06*
AFQTC I & II	.09	12.65*

Denominator degrees of freedom for the model = 1212. Profile represents enlistee with the following characteristics: caucasian, less than 3 years of high school, entered January-June, Age 18, New England region, AFQTC IVs.
*Significant at level than the .0001 level.

ity of non-attrition that was associated with an arbitrarily selected reference profile (constant) which represented an 18 year old, mental group IVa caucasian with less than three years of high school who enlisted between January and June from tne New England census region. The estimated coefficients for the model (column 2) represent the incremental increase or decrease (depending on the sign) in the probability of non-attrition associated with a particular attribute relative to a person who possessed the reference profile characteristic in a given variable category. The total probability of non-attrition for a person with any given set of attributes is the value assigned to the constant plus the sum of the coefficients associated with the attribute a given individual possesses. Those attributes having the largest coefficients have the greatest impact on the prediction.

Several comments may prove helpful in following an interpretation of the results in Table 1. To be conservative, and in view of the large sample size, only those coefficients which were significant at the .0001 level or better were considered here to be meaningful for candidate profile comparison purposes. Because of the large sample size, differences in coefficients at the third decimal place were sometimes consequential at the .05 level when rounded up or down to two decimal places. By using the .0001 level as a statistical significance cutoff it was possible to limit the focus to those attributes whose coefficients were of a meaningful size in practical terms.

However, even at the .0001 level coefficients as small as .03 (3%) were significant in the present sample. And, by itself, an increase or decrease of 3% in non-attrition probability may seem of minor practical value. This points to the need to consider not just the impact of an individual coefficient, but rather, the cumulative total of all coefficients that distinguish a given candidate from the attributes possessed by the reference profile.

For example, the results in Table 1 indicate that a 17 year old who otherwise possessed identical attributes to the reference profile was only 4% more likely to involuntarily attrite than was the reference candidate (.42 - .04 = .38 or 38% probability of non-attrition). However, the more a given candidate departed from the reference profile on an accumulated attribute-by-attribute basis, the more that candidate would depart from the benchmark 42% non-attrition probability associated with a candidate who possessed the reference profile characteristics.

By accumulating the probabilities associated with a given candidate's attributes vis-a-vis the reference profile, and adding or subtracting these coefficients from .42 as appropriate, sizable overall differences in non-attrition likelihoods could be identified among this group of enlistees. For example, consider a candidate who had identical attributes to those of the reference profile candidate described earlier except that this second candidate had 3-4 years of high school but no diploma, was from the Other census region, and was in AFQTG II. Using only the .0001 level coefficients, this second candidate was 35% (.08 + .18 + .09) less likely than the reference candidate to attrite involuntarily on the basis of these three attribute dissimilarities alone. Thus, the second candidate had a 77% likelihood of not attriting involuntarily.

In short, the model establishes a basis of comparison among candidates with respect to non-attrition likelihoods. Although the results in Table 1 indicate that some attributes are more important than others in determining non-attrition likelihoods, the greatest discriminations result from comparisons of overall or "gestalt" profiles and not from a comparison limited to any single attribute.

A number of conclusions can be offered tentatively about the model while focusing only on coefficients that were significant at the .0001 level. First, years of education among this non-high school graduate population were positively associated with the probability of non-attrition. Therefore, the use of a simple high school/non-high school graduate selection heuristic may discard important information and fail to recognize that even among non-high school graduates the likelihood of involuntary attrition declines significantly as education level increases. Everything else being equal to the reference candidate, an individual with three to four years of high school had an 8% greater probability of non-attrition than an individual with less than three years of high school for the two year census used to estimate the model. Second, age was associated with attrition. Relative to an 18 year old, a 17 year old had a 4% greater chance of attriting. Third, census region appeared to be associated with attrition probabilities. Specifically, it appeared that non-high school graduates enlisting from the Mountain and Other census regions were better relative bets than individuals enlisting from the Mid-Atlantic, East North Central and East South Central regions. Finally, AFQTG was positively associated with non-attrition. Relative to an individual in AFQTG IVa, an individual in the next higher test group (IIIb) had a 3% greater probability of not attriting; an individual in group IIIa had a 6% greater probability of not attriting; and an individual in group I or II had a 9% greater likelihood of completing the first enlistment term.

Phase Two

In the second phase of the research, the model constructed from the 1974 and 1975 data (described above) was used to classify members of the 1976 cohort into a hierarchy of groups ranging from the lowest predicted attrition risk to the highest predicted risk. The predicted hierarchy of risk groupings was then compared to the actual attrition that occurred among the members of the 1976 cohort who had been placed in the various a priori risk groupings. This cross-validation procedure tested the assumption that the actual rates of attrition within each group would produce an array of ascending marginal rates in accord with the model's predictions.

Results of this procedure are shown in Table 2. Column 1 represents a cumulative hierarchy of the 1976 enlistees' predicted "quality" based on their relative non-attrition likelihoods that the regression model identified from the candidates' attributes. Columns 2 and 3 indicate the numbers of enlistees from within a total given enlistment quantity (column 1) who did not or did actually involuntarily attrite. For example, Table 2 shows that if only the very "best" (lowest predicted probability of attrition) 1,000 candidates had been enlisted in 1976, 741 of these would not have involuntarily attrited but 259 would have turned-over involuntarily. If the "next best" 1,000 candidates

TABLE 2

Prediction of 1976 Data from Regression Model and AFQTC

	Regression Model			
Total Enlisted	Total Non-Attrition	Total Attrition	Marginal Rate	Average Rate
1000	741	259	--	.26
2000	1485	515	.26±.03	.26
5000	3648	1352	.28± 02	.27
10000	6998	3002	.33±.01	.30
15000	10318	4682	.34±.01	.31
20000	13523	6477	.34±.01	.32
25000	16662	8338	.37±.01	.33
30000	19652	10348	.40±.01	.34
35000	22709	12291	.39±.01	.35
40000	25595	14405	.42±.01	.36
45000	28366	16634	.45±.01	.37
50000	31185	18815	.44±.01	.38
53580	33073	20507	.47±.01	.38

	AFQTC			
Total Enlisted	Total Non-Attrition	Total Attrition	Marginal Rate	Average Rate
1000	648	352	--	.35
2000	1300	700	.35±.01	.35
5000	3210	1790	.36±.02	.36
10000	6820	3180	.28±.01	.32
15000	9776	5224	.41±.01	.35
20000	12941	7059	.37±.01	.35
25000	16043	8957	.38±.01	.36
30000	18954	11045	.42±.01	.37
35000	21534	13466	.48±.01	.38
40000	24596	15404	.39±.01	.39
45000	27519	17409	.60±.01	.39
50000	30747	19253	.37±.01	.39
53580	33073	20507	.35±.01	.38

Marginal Rate indicates the change in rate of attrition due to the addition of enlistees necessary to reach the given cumulative total. Plus or minus number reflects a 95 percent confidence interval boundary on the given Marginal Rate. The same intervals hold for the accompanying Average Rate.

were subsequently enlisted and thus added to the initial pool of 1,000 "best" candidates, this total of 2,000 enlistees would have yielded a total non-attrition of 1,485 and attrition of 515. Then, adding the "next best" quantity of 3,000 to the "better" (previous) group of 2,000 would have yielded a total enlistment of 5,000 of which 3,648 would not have turned-over, and so on.

Column 4 shows the marginal attrition rate associated with enlisting the associated quantity of "next best" candidates to the previous group of better candidates, and column 5 shows the average attrition rate within a given cumulative quantity. For example, the average actual attrition rate among the model's predicted "best" 2,000 enlistees was 26% (515 ÷ 2,000). However, had the "next best" group of 3,000 enlistees been added, for a total of the 5,000 cumulative "best" enlistees, the average actual rate became 27% (1,352 ÷ 5,000) because the marginal rate (which indicates the change in actual attrition rate due to the addition of the next best group) become 28% (i.e., (1,352 - 515) ÷ 3,000). Thus if one were to have started by enlisting the relative "best" 5,000 enlistees (according to the model's assessment) one would see from

Table 2, column 3 that 1,352 of these soldiers would actually have been lost to involuntary attrition, for an average attrition rate among the top 5,000 soldiers of 27%. However, the table also shows that if one were then to proceed and enlist the next best group of 5,000 soldiers to arrive at a total of 10,000 enlisted, the marginal attrition rate among this new group of 5,000 would be 33%, a sizable increase in actual attrition relative to the first (better) 5,000 enlistees identified by the model.

Overall, it can be seen from column 4 of Table 2 that the model was able to discriminate risk probabilities well, as indicated by the general pattern of ascending actual marginal attrition rates that emerged from digging deeper and deeper into a progressively higher-risk applicant pool. Indeed, it can be seen that if the model had been used to select, progressively, the 53,580 applicants who were actually enlisted in 1976, 47% of the "last" 3,5000 soldiers identified by the model would have experienced involuntary attrition. Thus, if such a model had actually been used to select the 1976 cohort it would have allowed recruiters to determine, before the fact, that some recruits were far more likely to attrite involuntarily than were others. The remedial implications of this information for recruit management and training are discussed in a later section.

In an effort to examine the relative utility of the actuarial regression model, its results were compared to the results achieved by using the AFQTG alone as the risk grouping criterion. At present, AFQTG standing represents the dominant selection heuristic used within non-high school graduate applicant populations. Results of using AFQTG scores alone to order the 1976 cohort are also shown in Table 2 (columns 6, 7, 8, and 9). It can be seen that when compared to the regression-based groupings, AFQTG predictions did not discriminate as well among groups with respect to the actual involuntary attrition that occurred within the 1976 cohort. In particular, a relatively consistent increasing hierarchy of marginal rates was not produced by the AFQTG criterion. Thus, in several instances, use of the AFQTG criterion would have led to the enlistment of actual "poorer risk" individuals before better risk individuals had been enlisted in 1976.

A closer comparison of the results in Table 2 indicates that, relative to using the AFQTG criterion alone, the regression-based grouping was better able to effectively discriminate among the very lowest risk probability groups. For example, if the model was used to select progressively the "best" 15,000 enlistees, an average involuntary attrition rate of 31% (4,682 ÷ 15,000) would have resulted with a marginal rate (the addition of 5,000 enlistees to the previous better 10,000) of 34%. By contrast, using the AFQTG heuristic would have resulted in an average involuntary attrition rate of 35% (5,224 ÷ 15,000) among its "best" 15,000 enlistees and a marginal rate of 41% when the "next best" 5,000 enlistees were added to the previous 10,000 to achieve 15,000 total. Thus, in the AFQTG "best" set of 15,000 recruits, 542 more soldiers would have failed to meet minimum behavioral or performance criteria than would have been the case with the regression model's "best" 15,000 soldiers. Such a difference in prediction may hold important implications for improving assignment decisions, and this issue will be discussed below.

Discussion

Several tentative conclusions emerge from this study. First, individuals who did not have a high school diploma when they enlisted into the Army in the 1974-1976 time period did differ with respect to their probability of involuntary attrition as a function of their different attribute profiles. Therefore, policy decisions which treat non-high school graduates as a homogeneous entity vis-a-vis attrition might warrant reconsideration. Second, individuals who have a lower risk of attrition can be differentiated from individuals who have a higher risk of attrition by using an actuarial regression procedure of the sort that has been described here. Moreover, the results produced by the model indicate that it provides better predictions of attrition risk than the use of AFQTG alone. Thus, recruiting officials may wish to consider using systematically more of the information that is made available in the enlistment process.

The use of such a model may hold special utility in the non-high school graduate market segment. In spite of the several factors which make it difficult to fill Army accession quotas entirely with high school graduates, proportional limits on the accession of non-high school graduates are becoming increasingly restrictive (DoD, 1981). In part, the tendency to forego (when possible) recruiting in the non-high school graduate market is probably due to the high aggregate attrition rates historically associated with this source of recruits. However, the present results suggest that attrition risk is not homogeneous in the non-high school graduate market segment and the use of the present form of model might substantially reduce the risks involved with selecting from within this applicant pool.

It should also be noted that the utility of such a model can become even greater if recruiters are able to improve their selection ratios by generating a larger applicant pool relative to the number of openings. As more and more applicants compete for a given opening the use of a selection model gains in usefulness by allowing recruiters to make more sensitive determinations of who should be selected and who should be denied. Indeed, it is when all who apply must be accepted that the term "selection" losses its meaning and so also do selection models lose their utility.

In this regard, the present results indicate the need to consider the trade-offs involved in attempting to expand the size of the applicant pool relative to the costs associated with this expansion. When, as the regression model indicates, involuntary attrition approaches 50% in the "poorest" non-high school graduate groups who are actually enlisted, an important tradeoff question arises. Namely, have the costs associated with attrition in high-risk groups reached the point where such groups should not be enlisted? Instead, should the funds which would otherwise predictably be lost to turnover be allocated toward efforts to increase the applicant pool thereby permitting the identification and selection of lower-risk candidates?

Although the regression model helps to raise such an issue, it does little to resolve it at present. The model does indicate, however, that the relative costs due to attrition are likely to vary among groups as the relative

proportion of attrition varies across groups. Accordingly, an important focus of future research may be to link this information with data regarding the actual costs of attrition. For example, McConnell and McNichols (1979) have estimated that the variable cost for accessing a non-prior service, male, high school graduate in 1978 was $9,334 for an entire enlistment period (this included $2,391 for recruiting and advertising). In addition, they state that the recruiting and advertising costs involved with non-high school graduate accessions is assumed to be zero. Therefore, if the $2,391 assignable to recruiting and advertising is subtracted from $9,334, $6,943 results as an estimate of the accession cost for a non-high school graduate, non-prior service Army enlistee for one complete term. Although these estimates can be useful in many applications, a difficulty with their use in the present model is that they are based on a completed enlistment term. If these estimates were used in conjunction with the present model they would tend to overestimate some variable costs by an indeterminant amount because attrition does not occur for all individuals at precisely the same time. In addition, the figure may underestimate the costs of unit turbulence, separation processing, and other costs associated with involuntary attrition. Therefore, an additional area in need of research involves identifying the times at which attrition occurs among enlistee populations and the costs assignable to attrittees at the time attrition occurs. Such information is critical before the present model can be used to aid in cost/benefit analyses concerning expansion of the applicant pool.

The utility of the statistical model presented here is, of course, highly dependent on the selection ratios which confront recruiters at a point in time. And selection ratios may be influenced by changes in policy decisions concerning inducements to enlist. Because of this, it is our opinion that the greatest immediate utility in the actuarial approach described here may not be for selection decisions but rather for assignment decisions. Given existing selection ratios, and knowing that many identifiable high-risk candidates are present in the enlistment pool, an important issue becomes how to best manage comparatively high-risk enlistees. In this regard, the present model may be useful in at least two ways.

First, the model's ability to discriminate accurately the risk probability of groups of similar individuals could allow recruiters and trainers to make more informed assignments of high-risk candidates to special programs aimed at reducing a priori attrition probabilities. Examples of such programs might include "realistic job previews" (Mobley, Horner, & Meglino, 1980) to permit a more informed enlistment decision on the part of the candidate and provide a better before-the-fact convergence between the applicant's expectations about military training and the realities of such training. High-risk individuals who are identified by the model might also be selected for special "early assimilation programs" (Mobley, Hand, Baker & Meglino, 1979) which, in addition to incorporating realistic job previews, are designed to provide special training concerned with socialization and adaptation to military life before basic military training is started.

Second, results in Table 2 indicated that compared to AFQTG predictions the model was especially effective at identifying the very lowest risk groups. This low-risk superiority of the model may be especially important when one

considers that it is those individuals in the ostensibly low-risk groups who are most likely to be assigned the more demanding, high cost, and perhaps, critical Military Occupational Specialties. Holding other factors constant, the use of the model to more accurately identify these "best bets" and assign them to the more critical specialities could have led to less actual attrition in these specialities than would have resulted from AFQTG predictions alone.

Conclusion

The fundamental purpose of this investigation was to test the assumption that non-high school graduate Army enlistees constitute a relatively homogeneous group with respect to the risk of involuntary attrition. To date, Army selection policy has indicated an implicit acceptance of this assumption in that accession quotas for this group have been filled without developing enlistment priorities among such candidates once minimum AFQTG criteria have been met.

Results of the present study indicated that attrition risk is not homogeneous among these candidates, and that operationally meaningful distinctions in risk can be identified with the model described in this paper. Use of this model may therefore help Army policy makers improve enlistment and assignment decisions concerning non-high school graduates. Moreover, such an improvement can be effected without changes in the quantity of information that is presently available to recruiters, and without major changes in exisiting recruiting tactics or manpower policies. In the event that policy changes do lead to greater recruiting effort or other changes occur which improve selection ratios, the use of the model described here can provide even greater utility to recruiters than under existing circumstances.

For example, if the number of non-high school applicants can be expanded relative to accession quotas for this group, the model can lead to lower average attrition. The model could be used to identify comparatively high-risk candidates who would be assigned low enlistment priorities as quotas are filled iteratively; first with the best risks, and progressively with increasingly poorer risks, until the accession goal is met. Unlike the selection protocol presently used by the Army, such a procedure would help to insure that the best risks are enlisted before poorer risks, and in the event that quotas are filled before all applicants can be accepted, those who are excluded would always possess the highest a priori attrition risk. As the analysis demonstrated, if the Army's present selection heuristic were used to assign accession priorities to candidates in this group it could lead to the enlistment of poorer risks before better risks.

The model could also prove useful in assignment and recruit management decisions. Specifically, high-risk enlistees who are identified by the model could be assigned to special remedial programs. This might not only help to reduce average attrition within the non-high school graduate group as a whole, but also to result in an improved allocation of recruits to the limited slots in these presently experimental programs.

Further research with such a model seems warranted. Although this effort was limited to predicting involuntary attrition, the same analytical frame-

work could be used to study voluntary turnover and other behavioral outcomes. Additional investigations of this kind may help policy makers generate decisions that will improve enlistment and assignment results under the All Volunteer Force concept.

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ENVIRONMENTAL FACTORS AND RETENTION DECISIONS OF HEALTH CARE PROVIDERS

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Although problems associated with turnover and retention continue to plague military managers, the complexity of such problems seemingly elude many investigators. Several authors have indicated that the majority of studies purporting to study turnover or attrition tend to be bivariate in nature (Hom & Hulin, 1981; Mobley, Griffith, Hand, & Meglino 1979). While such studies are useful in identifying important correlates of turnover behavior, they typically lack the breadth to assess relative contributions of different categories of variables in explaining the turnover process (Spencer & Steers, 1980).

To illustrate this point, an accumulation of research evidence suggests a number of specific relationships between several different variables and job turnover. Age and organizational tenure, for example, have consistently predicted voluntary attrition with younger, less experienced employees generally seen as better candidates for organizational withdrawal (Mobley, Horner, & Hollingsworth, 1978; Porter, Steers, Mowday, & Boulian, 1974). Other background variables, such as sex and education have exhibited weak or inconsistent relationships with turnover behavior, yet are often viewed as potentially important moderators of the turnover decision process (Mobley, at al., 1979). Job characteristics, job attitude, and psychological climate measures have also been used successfully to explain attrition and withdrawal behavior. Briefly, enriched and supportive work environments coupled with high levels of job satisfaction have typically been associated with favorable retention decisions (Jones & James, 1979; LaRocco, Pugh & Gunderson, 1977; Butler & Jones, Note 1).

Studies attempting to relate turnover behavior and individual difference or job performance measures have generally been less successful than those cited above. Individual difference measures have been almost entirely neglected in studies of turnover, despite continued demonstrations of their value in explaining other aspects of organizational behavior and decision-making. In the few instances where such measures as locus of control or need strengths have been incorporated in turnover studies, results have either failed to generalize or have accounted for essentially trivial amounts of variance (Mobley, et al., 1979, Lau, Note 2). In terms of job performance, Martin, Price, and Mueller (1981) reported that nurses who left their jobs did not perform significantly better than those who stayed, despite indications in the literature which suggest that employees who leave their organizations are generally better performers.

Regardless of the value of contributions made by the studies cited above in increasing understanding of specific aspects of turnover behavior, others have underscored the need to develop more comprehensive, multivariate, process approaches to explaining turnover decision-making (Hom & Hulin, 1981; Mobley, et al., 1979; Spencer & Steers, 1980). In particular, studies are

necessary that can concurrently assess the contribution of measures representative of multiple variable domains previously demonstrated as antecedent correlates of turnover. The current study compared the relative influences of five major sets of variables (i.e., demographic, personality, job attitudes, perceived work environment, and supervisor-rated performance) to determine their contributions in explaining individual retention decisions.

Method

Sample. The sample consisted of 163 individuals (69% response rate) assigned to five branch clinics assigned to a large Naval Regional Medical Center. Overall, 66% were assigned to a direct care billet, 77% were male, and 71% were rated hospital corpsmen (e.g., mean paygrade = E-4). Age and level of education ranged from 19 to 48 years ($\underline{M}$ = 26.4 years) and tenth grade to post baccalaureate ($\underline{M}$ = 13.2 years), respectively.

Questionnaire administration. A questionnaire designed to measure concepts within each of the major variable domains noted earlier was administered voluntarily in small group sessions during normal working hours. Demographic characteristics included measures of the respondent's age, sex, paygrade, job type (medical vs. nonmedical job assignment), education, and the length of time spent in (a) the Navy, (b) current paygrade, and (c) present duty assignment. Personality measures included self-esteem (Rosenberg, 1965), state anxiety (Spielberger, Gorsuch, & Lushene, 1970), multidimensional locus of control (Levenson, 1973), status concern (Kaufman, 1957), cognitive complexity (Jones & Butler, 1980), manifest needs (Steers & Braunstein, 1976), and compliance with conventional work norms (James & Jones, 1980). The job attitude measures were job involvement (Lodahl & Kejner, 1965), perceived task importance, job and Navy satisfaction, and the individual's anticipated retention decision.

The work environment measures consisted of 23 composites designed to reflect different dimensions of perceived work climate, specifically leadership, work strain, job characteristics, and other relatively enduring aspects of the workgroup and organization (Jones & James, 1979). Finally, supervisor assessments of job performance were obtained approximately six weeks following the collection of questionnaire data. The job performance ratings reflected willingness to put in extra time and effort, carelessness,

effectiveness of emergency medical skills, positive patient-related attitudes, nonprofessional demeanor, and a single item assessing the quality of the individual's overall behavior.

Analysis. Analysis of the data proceeded in four stages. First, the 23 work environment composites were component analyzed to produce a reduced set of more global measures. Second, the sample was divided into high (n = 46), undecided (n = 49), or low (n = 68) intention groups based on an individual's stated intent to remain in the naval service. Third, multiple discriminant analyses were conducted to identify significant between retention group discriminators drawn from each variable domain. Finally, the results of the separate within domain analyses were combined to produce a summary discriminant analysis designed to identify, across variable domains, those measures most strongly identified with turnover intention.

Results

Components analysis. A principal components analysis of the 23 individual work environment measures produced four components with eigenvalues $\geq$ 1.0. The first component was rather strikingly defined by measures associated with a variety of leader behaviors, including aspects of leader influence, goal emphasis, interaction and facilitation skills, and trust. The second component was dominated by measures of workgroup (e.g., cooperation, pride, friendliness) and organizational (openness of expression, organizational esprit) characteristics; and generally reflected a variety of situational or unit influences. The third component was defined most clearly by job characteristic measures (e.g., variety, challenge, importance, and autonomy), while the final component reflected a pressure, conflict, or general strain dimension. Based upon this pattern of relationships, the four components were labelled Leadership Facilitation and Support, Unit Influences, Job Enlargement, and Job Pressure. Component scores (M = 0, SD = 1.0) were computed for each participant on each of the four work environment dimensions by a direct solution method (Harman, 1967) for use in the remaining analyses.

Within domain analyses. Differences between turnover intention groups were identified using multiple discriminant analysis. The significant discriminating variables from each of these analyses, along with the total

sample means, standard deviations, and associated internal consistency estimates (where appropriate) are listed in Table 1. For the eight background

Table 1

Means, Standard Deviations, and Internal Consistency Estimates for Significant Turnover Intention Groups Discriminators (n = 163)

Variable Domain	M	SD	No. of Items	α
I. Background Measures				
1. Paygrade	4.42	1.47	1	n.a.
2. Age	26.39	5.78	1	n.a.
3. Months on Active Duty	69.17	66.87	1	n.a.
II. Personality Measures				
1. Work Values	47.96	7.02	13	.87
2. Need for Independence	11.99	2.31	4	.42
3. Need for Solitude	10.33	2.23	4	.52
4. Need for Dominance	16.21	3.36	5	.77
5. Internal Control	34.53	4.54	7	.62
6. Chance Control	20.88	6.77	8	.78
7. Impetuosity	7.17	1.96	3	.43
III. Job Attitude Measures				
1. Navy Satisfaction	11.54	3.34	4	.73
2. Job Involvement	16.85	4.77	6	.80
IV. Work Environment Measures				
1. Unit Influences	.01	1.03	-	n.a.
2. Job Enlargement	.04	.97	-	n.a.
V. Job Performance Measures				
1. Extra Effort	22.14	5.20	6	.90
2. Non-Professional Demeanor	7.83	2.68	4	.70

measures, two significant functions were obtained (r_c = .50, p < .001 and r_c = .30, p < .05, respectively), although only paygrade, age and months on active duty had both interpretable standardized discriminant function coefficients (i.e., $\pm \geq .30$) and significant univariate F-ratios. These three variables were retained for later use. The personality measures analysis also generated two significant discriminant functions (r_c = .50, p < .001 and r_c = .40, p < .05, respectively). The significant variables included work values, needs for independence, solitude, and dominance (from manifest needs), internal and chance locus of control, and impetuosity (from cognitive complexity).

Analysis of the three remaining domain categories produced a single significant discriminant function in each instance. For the job attitude domain, this function was principally defined by the Navy satisfaction and job involvement measures (r_c = .54, p < .001). For the four work environment components described in the preceding section, only the Unit Influences and Job Enlargement dimensions produced significant between-group discrimination (r_c = .73, p < .001). Although the only measures of supervisor-rated job performance that failed to discriminate between turnover intention groups at the univariate level were positive patient attitude and the single-item measure of overall behavior (r_c = .31, p < .05 for this function), only the extra effort and non-professional demeanor measures were also significant discriminators at the multivariate level.

Across domain analysis. A final stepwise discriminant analysis was conducted which produced two significant functions (r_c = .63, p < .001 and r_c = .41, p < .001, respectively) and utilized only 10 of the 16 variables shown in Table 1. Inspection of the marker variables for the first function indicated that five of the original 16 variables were related to turnover intention, including Navy satisfaction, job enlargement, needs for independence and dominance, and job involvement. The second function was defined by seven variables, including months on active duty, work values, needs for independence and solitude, both locus of control measures, and, to a lesser extent, Navy satisfaction. Finally, using those 10 variables correct group classification was obtained for 67.6% of the high intent to remain group, 61.2% of the undecided group, and 63.0% of the low intent to remain group (64.4% correct classification, overall). Interestingly, none of the job performance measures made a unique contribution beyond the variables just noted and were deleted from further analysis.

Table 2 contains the discriminant structure matrix and group centroids for the final, reduced list of discriminating variables. In addition,

Table 2

Rotated Discriminant Function Coefficients and Group Centroid Means

I. Rotated Discriminant Function Coefficients	Function	
Variables[1]	I	II
1. Navy Satisfaction	.59	-.01
2. Need for Independence	-.43	.21
3. Job Involvement	.27	.05
4. Job Enlargement	-.26	-.06
5. Need for Dominance	.24	-.01
6. Months on Active Duty	.13	.71
7. Need for Solitude	.33	-.47
8. Work Values	.15	-.34
9. Internal Control	.03	.30
10. Clearance Control	.20	-.27
II. Centroid Means		
1. High Intention Group	.92	.75
2. Undecided Group	.33	-.60
3. Low Intention Group	-.86	-.08

[1]Variables are ordered by the function with the largest coefficient and the magnitude of that coefficient.

Figures 1 and 2 illustrate the overall pattern of these results by showing the group profiles plotted for each discriminant function. Joint inspection of the rotated discriminant function coefficients and centroid means contained in Table 2 and the values plotted in the respective figures can be used to aid interpretation. The first function, for example, appears to maximally discriminate between high and low intention groups. Mean differences on discriminating variables were most salient for Navy satisfaction, need for independence, job involvement, job enlargement, and need for dominance. More specifically those individuals with a high intent to remain would likely report higher levels of (a) satisfaction with the Navy, (b) job involvement, (c) job enlargement, and (d) needs for dominance. Additionally, such individuals would likely have a greater tendency toward group cooperation as evidenced by lower needs for independence.

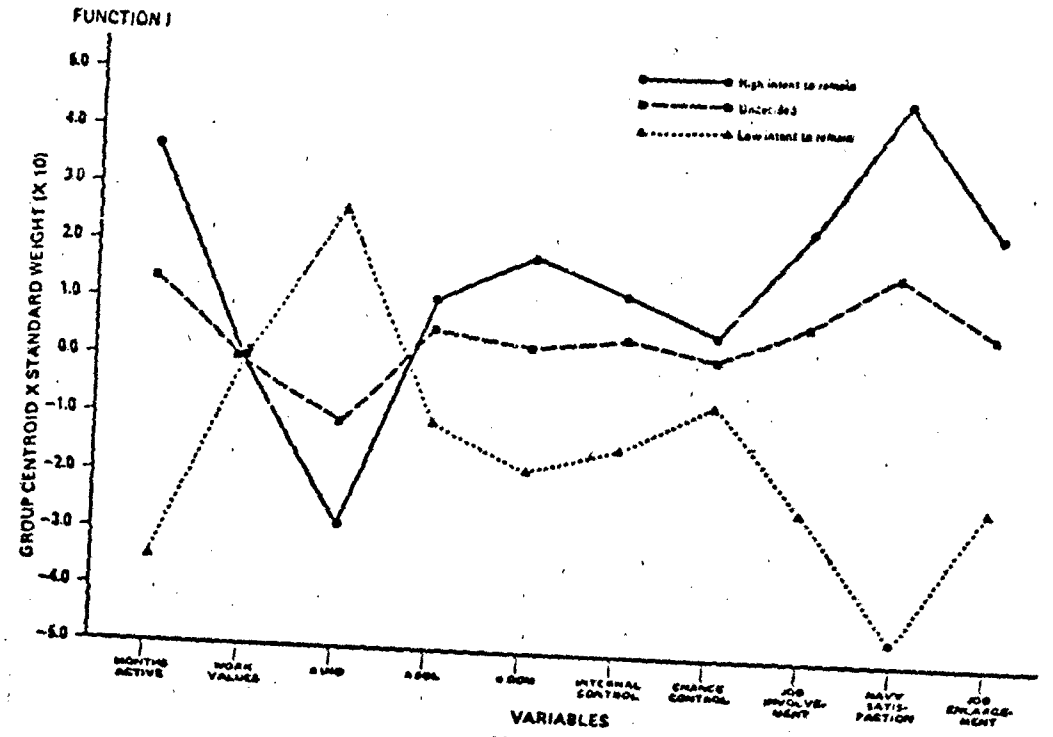

Figure 1
Turnover Intention Group Profiles for Function I

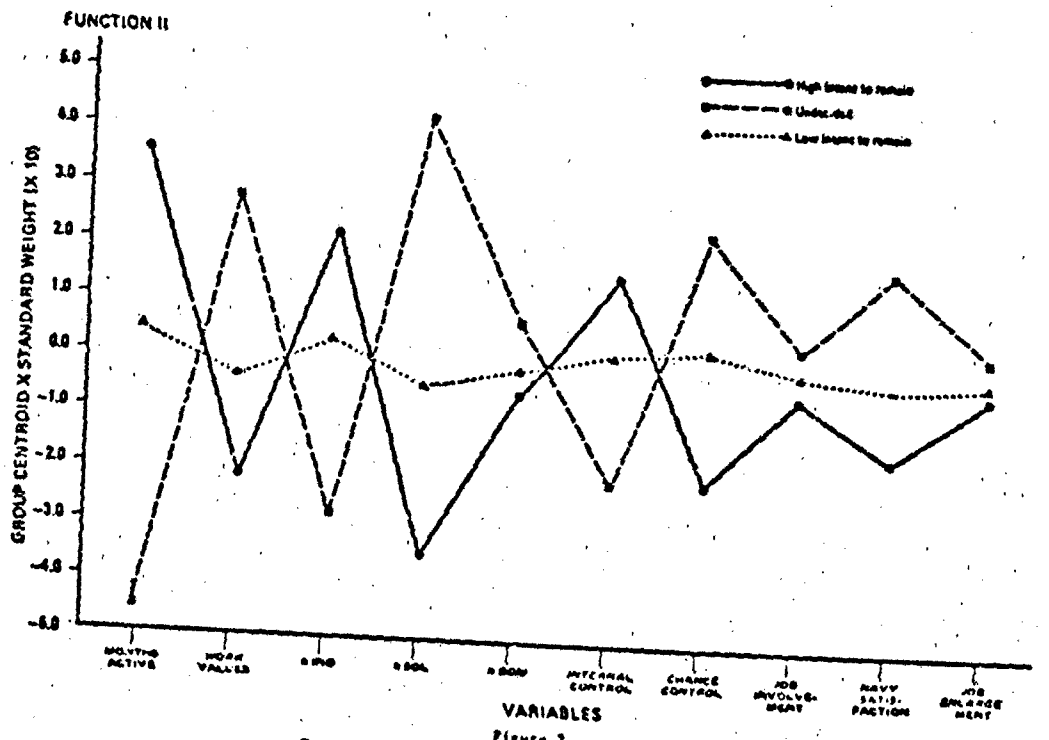

Figure 2
Turnover Intention Group Profiles for Function II

The second function discriminated between the high intent to remain and undecided groups. In this case, months on active duty, need for solitude, work values, and locus of control were the salient variables contributing to between groups discrimination. In terms of these variables, undecided individuals could be characterized as (a) at a four-year point in their naval careers, (b) oriented toward an external locus of control, (c) expressing greater needs for solitude or autonomy, and (d) subscribing somewhat less to traditional normative work values.

Discussion

The present study examined the relative contribution of five major variable domains in explaining individual retention decisions. Due to the nature of the criterion used in this study (intentional versus actual behaviors), however, these efforts must be viewed as somewhat exploratory. Nevertheless, since the approach taken was consistent with the multivariate orientation advocated by Mobley, et al., (1979), several tentative points will be made.

First, and as frequently reported in the turnover literature, a combination of job attitude (job involvement and Navy satisfaction) and work environment (job enlargement) measures contributed strongly in discriminating between high and low turnover intention groups. Less frequently observed in this literature were the significant contributions on this function from the personality domain (individual need strengths). Mobley, et al., (1979), for example, reported a single effort which incorporated a measure of need strength (need for achievement) in a study of turnover (e.g., Hines, 1973). Although the need for achievement measure used in the current study was overshadowed by the contribution of needs for dominance and independence, the value in pursuing need strengths as potentially important constructs in explaining additional variance in turnover decisions is apparent. Other studies have shown, for example, that intrinsic needs moderate the job characteristic - job satisfaction (Stone, Mowday, & Porter, 1977) or job performance relationships (Steers & Spencer, 1977). Based on such findings, one might hypothesize that needs for independence and perceived job autonomy would be positively related for members of the high intent to remain group, unrelated in the undecided group, and negatively related in the low intent group. The fact that this hypothesis received partial support in the current study (r = .18, .00, and -.21 for high to low intent groups, respectively) despite the problem of small sample size argues favorably for the inclusion of need strengths in future studies of turnover.

The second discriminant function generated in this study was defined by a combination of background and personality dimensions which were most useful in describing differences between the high intent to remain and the undecided groups. Given the pattern depicted in Figure 2, individuals with a favorable retention posture could be described (beyond the effects of length of service) as (a) oriented toward working with others, (b) subscribing to normative, Protestant-ethic work values, and (c) possessing an internal locus of control. Considering the difference in average length of service between the high and undecided groups (9.5 years versus 4 years), the remainder of this function seemingly describes a maturity/experience dimension associated with turnover decision-making. The validity of this

interpretation especially regarding the inclusion of personality measures, remains a question for future research.

Finally, it is noteworthy that supervisor ratings of job performance were not retained as discriminators of turnover intention group, despite the fact that several of the performance measures showed substantial between group differences at the univariate level. Ratings of extra effort, for example, were significantly higher for the high intent to remain group ($p < .05$). Similarly, low intent individuals were rated as significantly higher on non-professional demeanor ($p < .01$). None of these differences, however, were upheld at the multivariate level. These results are in essential agreement with those reported by Martin, et al., (1981) who also found that job performance was not related to turnover.

In summary, the current study identified, across multiple variable domains, two discriminant functions that significantly differentiated between turnover intention groups. The first function was bipolar in nature anchored by work-related variables at the positive end and need for independence at the negative end. The second function was also bipolar in nature (organizational tenure X personality), and maximally discriminated between high intent to remain and undecided groups. In addition, supervisor ratings of job performance were not found to be significant between group discriminators at the multivariate level. Additional research to validate these findings utilizing actual turnover data is recommended.

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PROJECT RETAIN: COUNTERATTRITION FOR GENERAL DETAIL SEAMAN

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Since the advent of the All-Volunteer Force in 1973, the Navy has been experiencing unacceptably high premature attrition rates among first-term enlistees. Accession cohort experience and projections indicate that between 35 and 38 percent of all recruits entering the service between FY-74 and FY-77 were or will be discharged prior to completing their active obligated service (Goodstadt and Yedlin, 1979). Although first-term attrition has begun to decline in the past two years, the rate for General Detail (GENDET) personnel remains at an unacceptably high 80 percent. The Navy's non "A" school personnel represent only 27 percent of the first-term population but they account for 70 percent of total first-term attrition. Currently, 70 percent of the GENDET force become Seaman Apprentices and are assigned to the fleet to perform shipboard maintenance. Recent NPRDC research (Voluntary Release Pilot Programs I and II) found Seaman Apprentices to have the Navy's highest attrition rates; 54.3 percent of the Seaman Apprentices in the control group had attrited after completing two years of their enlistment (Guthrie, Lakota, and Matlock, 1978).

The problem of maintaining an adequate number of GENDET sailors is a complex one. The set of interventions to be developed, tested, and evaluated in Project RETAIN represents one approach to managing GENDET attrition and increasing and stabilizing the GENDET manpower pool. The project is unique in that it tested two interventions that touch early critical transition points of a GENDET's enlistment: adjustment to recruit training, and orientation to fleet duty.

Adjustment

Adjustment to Navy life is a socialization process that begins with recruit training. Recruits must deal with situations somewhat new and strange to them, without the supports that have been familiar to them in the past. Behavior which was adaptive and appropriate within their civilian environment is now often found to be inappropriate and unacceptable. This can often lead to apprehension and stress, which, when coupled with inadequate knowledge of the options available, result in maladaptive behavior by the recruit and disciplinary problems for the Navy. Recruits who exhibit such problems are likely to be setback in training. Recent NPRDC research (Farkas, in press) has indicated that most of those who eventually become recruit training attrites began the process of attrition by being setback. GENDETs are an at-risk group for poor attitudes, disciplinary problems, poor performance, and work habits. The process of attrition just described is especially applicable to this population. GENDETs need to learn more about what to expect from the Navy and what the Navy expects from them and about more adaptive ways of responding to the realities of military life before behavior problems develop. The adjustment intervention in RETAIN developed a training program combining both information and skill training, which was offered at the start of recruit training, to help GENDET-destined recruits acquire the skills they need to adjust to military life, before serious difficulties can begin.

Program development. Relevant civilian and military adjustment programs were reviewed and recruits, staff, and instuctors at RTC San Diego were interviewed to determine aspects of boot camp and the Navy about which recruits have inadequate information and to specify stress-producing situations commonly experienced by recruits. Using this information, a three-day program was designed consisting of information and skill training which will help GENDET-destined recruits make it through boot camp successfully. The already developed "Realistic Preview of Recruit Training" videotape served as a point of departure for discussing boot camp procedures. The program combined: (1) a classroom-based curriculum designed to provide recruits with basic information and skills with, (2) a living environment that simulates the conditions of boot camp.

Field test. Six regular Recruit Company Commanders were trained in September 1980 to be instructors for the adjustment program. The program was in place at RTC San Diego from October 1980 through February 1981, and was limited to those recruits who entered RTC without "A" school guarantees. Recruits were pulled out of training for the three-day program immediately following receiving and outfitting, at the time recruit companies were being formed. Two classes with a minimum of 15 recruits each were formed weekly during the field test period. At the end of the adjustment program, the recruits re-entered the normal training sequence, joined companies forming at that time, and proceeded with boot camp. Boot camp performance, disciplinary actions and setbacks, and attrition for recruits receiving the program and for a cohort not receiving the program were used to assess the short term effectiveness of the training.

Results. A total of 488 recruits completed the Recruit Adjustment Training Program, and 231 recruits were selected as matched controls. Preliminary recruit training attrition data indicates a 10.4% loss rate for the experimental group and 15.6% loss rate for the control group. Of the recruit training survivors in both groups, 8.5% of the experimenatal group and 13.1% of the control group had one or more disciplinary actions against them during boot camp.

Orientation

Following boot camp, GENDET-destined recruits go directly to an apprenticeship training program designed to prepare them for their fleet assignments. Guthrie et al. (1978) found that many graduates of the Seaman Apprentice program reporting to their first duty station felt ill-prepared for shipboard life and lacking in the essential basic skills needed to do their actual jobs. In addition, GENDETs often report to their first shipboard duty station with unrealistic expectations and misinformation concerning their actual fleet opportunities and the manner in which they can be realized (Guthrie et al., 1978; Lau, 1979). The expanded four-week Seaman Apprentice training program, initiated by CNET, is expected to improved skill training. The orientation component of RETAIN is an attempt to further improve the situation by providing to Seaman Apprentices aspects of transition training not now included in the CNET expanded curriculum. The orientation program provided the Seaman Apprentices with a realistic picture of shipboard living and working conditions. The program also emphasized in a realistic manner what GENDETs can expect to find

in the fleet and the opportunities which exist for them. RETAIN will evaluate the effectiveness of four different delivery systems, ranging from classroom only to predominantly shipboard, for providing shipboard orientation to GENDET sailors.

Program development. Deck Division Officers and Chiefs were surveyed to determine the kinds of adaptation problems faced by newly reporting Seaman Apprentices. Existing orientation programs and literature on shipboard adjustment was reviewed. Using this information, an orientation program for graduates of Seaman Apprentice training was developed to facilitate their orientation to shipboard life, and provide them with accurate information about career opportunities available in the fleet. The program consisted of five days of training, presented under one of the following four delivery systems:

Classroom only - Orientation was provided through liberal use of audio-visual materials, primarily videotape presentations, and the use of in-class simulations as appropriate.

Ship visits - Classroom instruction was supplemented with a three-hour visit to ships berthed in the San Diego area, a tour of the Naval Station docks, and one full day working on a yard tug boat.

Shipboard living - Students spent the entire program living and working onboard an in port ship, under the supervision of the ship's crew and program instructors.

Shipboard underway - In addition to living and working onboard ship, students got underway and participated in the ship's activities.

Field test. Three temporary active duty instructors were trained to deliver the orientation program in January 1981. The program was in place at Naval Station, San Diego, for 22 weeks, from February through August 1981. Graduates of Seaman Apprentice training were detailed to the program immediately following apprentice training. Each delivery system was in place for a minimum of four weeks during the field test period, with weekly classes of up to 25 students each. A control cohort of graduates completing Seaman Apprentice training during the field test period was identified. The performance of both cohorts will be tracked in the fleet. The longer-term evaluation of the orientation program will compare job performance, disciplinary record, and attrition for the two groups. Results are not as yet available.

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A UNIT-LEVEL APPROACH TO ATTRITION RESEARCH: DOCUMENTING THE CHAIN OF COMMAND'S ROLE IN DISCHARGES

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Introduction

In order to better inform manpower policy and planning, DOD and the individual services have initiated a number of research efforts to gain an understanding of those factors which influence attrition (see reviews by Goodstadt & Glickman, 1975; Goodstadt & Yedlin, 1979; Kissler, 1978; Sinaiko, 1977). The majority of these investigations have treated attrition incidents as events which occur to individuals. That is, research has focused on identifying individual characteristics (such as education, age, mental group category) or on pinpointing individual experiences (e.g., disconfirmation of expectations, inability to cope with the environment) which are associated with an early discharge. Such efforts have implications for screening procedures for training programs and for realistic job preview techniques.

However, given limitations inherent in these and other attrition management strategies, there is need to keep our options open with respect to our understanding of attrition. From such an "open" perspective, one may conceive of alternative ways to view attrition. That is, rather than focusing on attrition occurring among individuals, one may reasonably view attrition as a phenomenon which takes place in units and is influenced by the unit environment.

This paper outlines the development of a methodology for investigating unit-level attrition phenomena and points to the implications of this research for policy development.

Definition of a Unit-Level Approach to Attrition

Before describing our approach, it may be useful to provide a definition of a unit-level approach to attrition. This approach attempts to predict attrition from units by drawing upon information reflecting unit characteristics and descriptions of disciplinary decision making practices employed by the unit chain of command. For the purposes of this work, the unit of analysis is the unit, itself (typically, companies or battalions).

Evolution of the Unit-Level Approach

The development of an approach to unit-level analysis has evolved over the course of a series of projects. The first stage of this work was strictly conceptual in nature and took place in an early review paper developed for ONR in 1975.

The second stage of development entailed qualitative indepth interviews with first-termers and members of the chains of command of different Army units. This work was funded by ARI.

The third stage of work involves the development of quantitative evidence of the impact of chain of command decisionmaking on unit losses. This work is now underway and encompasses work in the Army (with sponsorship of OSD and ARI) and in the Marine Corps.

The fourth stage of development will begin to take shape in the coming year and entails administrative experiments designed to reduce attrition in units. This work will involve an extension of quantitative research now underway in the Army and in the Marine Corps.

Research to Date

Stage I: Initial Conceptualization

Early on, we undertook an ONR-sponsored effort to critically review then current (i.e., 1975) research on attrition, and to identify "gaps" in existing or planned work. One of the gaps identified related to the lack of knowledge regarding the role that supervisors play in the discharge process. In our report (Goodstadt & Glickman, 1975) we raised questions as to whether, and if so, how officers and NCO's initiate separation processing and/or whether discharges occur because an individual "requests" a voluntary separation. Our thinking at that time (which is also reflected in our current work) was concerned with determining what conditions shape organizational decisions to discharge individuals and how such conditions or decision strategies help explain differences in attrition across units and commands.

Stage II: Gathering Qualitative Evidence and Developing Hypotheses

In order to further develop our approach to unit-level attrition issues, we undertook (with ARI funding) qualitative research on the process by which attrition takes place in the post-training environment. This effort took place in the 1977-1978 timeframe and involved indepth interviews with a number of battalion commanders (N=10), subordinate company commanders (N=10), company-level non-commissioned officers (N=10) and first-term enlisted personnel (N=119), some of whom were undergoing processing for an Expeditious Discharge.

Interviews focused on 1) how discharges took place, 2) hypothesized reasons why early discharges occurred and 3) mechanisms available to manage attrition.

This qualitative effort served to make explicit the fact that the unit chain of command exerts influence over discharges.

The project also uncovered the form this influence took. For example, we found that members of the chain of command vary greatly in the way they diagnose problems in the unit, the resources that they use to deal with such problems and the degree to which they are willing to work with problem personnel prior to authorizing discharges. We also found that members of the chain of command were likely to view attrition as a means of solving management problems rather than as a problem in itself. Furthermore, it was clear that unit commanders varied in the degree to which they saw attrition as a significant and costly problem.

From a methodological perspective, this research helped us to conceptualize methods for quantifying the influence of the unit chain of command and for developing appropriate unit-level attrition criterion measures.

Stage III: Gathering Quantitative Evidence

The third stage of development is still underway and has focused on quantifying the relationship between chain of command practices and unit attrition rates. Three projects have advanced to the quantification stage--1) a recently completed effort which was funded jointly by OSD and ARI, 2) a project currently underway in the Marine Corps (with NPRDC funding), and 3) an effort recently initiated with ARI support.

Since the OSD/ARI effort served as the point of departure for developing the methodology we are using in other efforts, it provides a useful illustration of our approach. Our approach to this work entailed a survey of 59 battalion commanders and 244 of their subordinate company commanders. The survey was administered in six CONUS installations and the sample was stratified to allow control for unit educational composition and unit type. The questionnaire itself gathered information regarding conditions in the unit, problem incidence, approaches used to handle specific problems, guidance provided by superiors concerning discharges, and command philosophy regarding early discharges.

Perhaps the most important aspect of this survey is the fact that we did not simply report "stand alone" survey results. Rather, we merged commander survey data with aggregate losses from the unit. The development of unit loss information was by no means routine and required several months of processing by DMDC to permit aggregation of individual losses to the unit level. With this information in hand, we developed rules for creating unit attrition rates as a function of the number of first-term personnel in the unit. We then constructed a loss rate for each unit which was keyed to the amount of time the survey respondent had spent in his command position. Following this extensive programming, we proceeded to examine the relationships between command practice and unit losses.

Several findings emerged. First, we found that company commanders appear to play a critical role in company-level attrition (despite the fact that battalion commanders actually control discharge authority). Second, analyses indicated that unit problems and practices used to manage problem personnel account for 30% of the variance in the administrative discharge rate (after controlling for the effects of education and unit type variables). This is a clear indication that factors other than personnel quality are exerting strong influences over attrition.

A third set of findings indicated that commanders' beliefs and philosophy are related to unit loss rates. Those commanders who 1) believe that expeditious discharges should be difficult to obtain 2) feel that expeditious discharges are not a useful management tool and 3) agree that there is greater need for documenting discharge processes are likely to have lower expeditious discharge rates (for a description of a parallel effort in the Marine Corps using this methodology see the Majchrzak paper in this volume).

Research in the Planning Stage

Stage IV: Administrative Experimentation

In order to derive maximum benefit from the results of our quantitative efforts, we will be moving ahead in the coming year to carry out administrative experiments based upon our findings. This work will test the effects on attrition of experimental variation in unit management policy and practice. The first of these efforts will be undertaken in the Marine Corps and will focus on battalion-level remedies for high attrition and UA rates. As a follow up to our current research in the Army, we are programmed in FY 82 to experimentally evaluate how increased referrals to various installation facilities influences unit-level attrition.

Implications

Our work to date has several implications. First, we have successfully documented the importance of unit management practices as an influence on attrition. Second, we believe, that our findings regarding management practice open up new avenues for the development of policies designed to counter attrition. Earlier we noted that individual-level research on attrition has implication for screening policy, training programs, and realistic job previews. It is clear to us that unit-level research provides an alternative set of management "handles" on the attrition problem. That is, on the basis of unit-level findings one can undertake revisions in discharge and disciplinary regulations and practices, one can develop training for members of the chain of command and one can develop information systems to sensitize commanders to unit losses and problems.

The methodological implications of this work also need to be underscored. This work provides a clear demonstration of the utility of survey data for understanding and predicting important organizational phenomena. Finally, it is our belief that unit-level methodologies may be applied to gain an understanding of how the application of management resources influences different kinds of manpower problems ranging from the effectiveness of recruiting stations to the disciplinary and reenlistment rates of different units.

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CONTINUOUS ESTIMATES OF ENLISTED SURVIVAL

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Center for Naval Analyses

With the onset of the all-volunteer force (AVF) in 1973, the Navy became increasingly concerned about the losses of first-term enlistees before the expiration of their obligated service. To help combat this problem, CNA developed a SCREEN (an acronym for "success chances of recruits entering the Navy") table (reference 1) of first-year survival probabilities to be used by recruiters in qualifying applicants for enlistment. It was put into effect in October 1976 and was revised in August 1977 (reference 2) and again in February 1980 (reference 3). The latest version of SCREEN is based on educational level, AFQT percentile score, and age.

Besides SCREEN, additional studies have been done by CNA which relate pre-service and in-service personnel characteristics to the probability of surviving to a given point in time (references 4, 5, and 6 for example). Each of these studies was based on a longtitudinal population of recruits followed from the date of their enlistment until either attrition or completion of their first term of service. Thus, when considering 4-year obligors, for instance, it was necessary to follow a cohort through 4 years of service.

To avoid following individuals for such a long period of time, we decided to consider a cross-sectional data base from which to obtain estimates of survival. Besides requiring only a relatively short period of follow-up, using a cross-sectional data base enables us to observe the most recent survival patterns. The statistical technique which we use to obtain survival estimates is called the Cox regression model (references 7 and 8). This model has the advantage of being able to generate a continuous survival curve rather than just a point-in-time estimate.

The main data base consists of all NPS male enlistees in the Navy as of 31 December 1978. These individuals were followed until the end of calendar 1979. Then all NPS male accessions into the Navy during 1979 were added to the data base. The total population represents approximately half a million men. Since each individual in the data base can be tracked back to his date of enlistment, we are able to estimate entire career survival patterns, i.e., survival chances through 30 years of service. For the purpose of this analysis, however, we consider it adequate to track enlistees through 8 years of service (more or less 2 terms).

Survival curves through 8 years of service were calculated for each combination of educational level (high school graduate, GED, or non-high school graduate), mental group (1-5), and age (17-24, $\geq$ 25). Separate

analyses were performed for Class A school attendees and non-A school attendees. Since recruits in our data base entered the Navy over a 30-year period, many different test batteries were used in computing mental group. Consequently, to make the various test results comparable, we converted each form to the current FY 1981 AFQT norms (reference 9).

Our objective is to replace the current SCREEN table with one which is more comprehensive in the sense that more information is taken into account. The survival curves, though interesting in themselves, are of little help to recruiters in qualifying applicants for enlistment. We therefore decided to summarize survival with the mean survival time (the area under the survival curve) measured in months. Mean survival times were calculated for each recruit profile. These times form the basis of a new SCREEN table which is computed by streamlining the table of mean survival times (over 4 years of service) and applying a cost-benefit analysis to determine optimal qualifying scores. The optimal qualifying score for A school attendees is 35 months and for non-A school attendees is 28 months.

As expected, we found that educational level has the greatest impact on survival. Recruits with a high school diploma survive considerably longer than non-high school graduates and those with a GED certificate. Through the first 4 years of service, the survival behavior of GEDs is very similar to that of non-high school graduates. However, after 8 years of service, GEDs who attended A school generally have a greater expected survival than corresponding non-high school graduates. This is very important, since it means that the benefit to the Navy of a GED certificate is not realized until after a recruit completes 4 years of service.

Surprisingly, mental group has only a mild impact on survival, with no consistent pattern observed. There is a clear pattern with respect to age, however. Ages 17-22 seem to be the optimal recruiting ages for A school attendees. For non-A school attendees, the optimal age range is 17-21. Survival declines with age after that.

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METHODOLOGICAL ISSUES IN THE STUDY OF ARMY REENLISTMENT

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The purpose of this paper is to describe some of the methodological problems we at ARI have had to solve in trying to construct a causal model of reenlistment, and to briefly describe the work in progress to construct such a model.

Over two years ago, the personnel in DA-DCSPER who manage the Army's reenlistment program, asked ARI to construct a quantitative "model" which could be used to predict reenlistment under different conditions and policies and which could be used to optimize the allocation of resources to different aspects of the Army Reenlistment Program. Note that they did not simply ask for a forecasting model, such as the one investigated in the elegant work of Alley & Gould (1975). Rather, they wanted a causal model of reenlistment which would allow not only forecasts of reenlistments under existing conditions, but also forecasts of reenlistment under a variety of hypothetical conditions which might arise due to changes in the Army environment or Army manpower policy.

The people requesting this model are particularly interested in modelling the effects of the resource and policy variables directly under their control. These variables include:

1. Reenlistment qualifications;
2. Reenlistment options;
3. Point in service when soldiers become eligible to reenlist;
4. Alternative ways of remaining in the Army (e.g. extensions);
5. Career counseling;
6. Reenlistment advertising;
7. Selective Reenlistment Bonus (SRB).

They are also aware of the need to include other variables in the model, such as sex, race, and civilian opportunities.

We have been working on the problems posed by such a research requirement for some time now. We have been concerned with three key issues:

1. The form such a model should take;
2. The research design required to develop the model;
3. The variables which should and should not be included in the model;

Let me tell you about our thinking on each of these issues in turn.

Type of Model Required

We considered two kinds of models as candidates, theoretical models and empirical models. Theoretical models include economic utility models, expectancy-value models of work motivation, and reinforcement models from social learning theory. Each of these has been used as a framework for a theory of vocational decision making which we considered relevant to reenlistment (Blau, Gustad, Jessor, Parnes, & Wilcock, 1956; Krumboltz, 1974; Jepsen & Dilley, 1974). We found these models useful in identifying and classifying variables (Eaton & Lawton, 1980), but none of them had sufficient generality to accomplish the prediction and optimization tasks required. We decided that what we needed was an empirically derived and validated multivariate regression equation.

Research Design and Method

Recall that the objective of our research is a causal model of reenlistment and not just a forecasting model. With this in mind, we considered three different research designs:

1. True experimental designs;

2. Correlational research designs;

3. Quasi-experimental research designs.

We rejected the idea of a true experiment. First, one-variable-at-a-time methodology does not provide information about potential interactions between the variables. Second, a multivariate experiment of the required magnitude is simply unfeasible due to the large number of variables.

We seriously considered correlational research designs, but concluded that they cannot provide the regression equation required. By correlational research design (Hays, 1973) we mean a design which involves drawing a "representative" sample of some well specified population, measuring their characteristics, then constructing a regression equation which relates one of the measured characteristics, the "dependent" variable, to the other, predictor variables. The regression equation obtained from such a research design depends heavily on the variables which are included in the research, on the distribution of predictor variables, and on the intercorrelations between the predictor variables. The important issue is that such designs do not allow the distinction between correlation and causation. The regression weights obtained in the analysis of data from such a research design would most likely <u>not</u> provide measures of the causal importance of the predictor variables, and might assign importance to variables which have no causal importance (Box, 1966; Mosteller and Tukey, 1978).

While considering correlational research methods, we seriously investigated the use of special questionnaire items. It is common practice in personnel surveys, like the reenlistment surveys conducted in the Army, to ask respondents to predict their own behavior under hypothetical conditions. That is, soldiers are asked not only "Do you intend to reenlist?" (assuming that conditions remain constant), but also "Would you reenlist if . . .?" where

some hypothetical condition is specified. While we know that statements about reenlistment intentions under present circumstances are good predictors of reenlistment behavior, we do not know anything about the validity of responses to such hypothetical questions.

We are currently conducting research on the psychometric characteristics of such item (Lawton, 1980). The results to date are mildly encouraging. Responses are reliable in test-retest measures, and they vary in theoretically predictable ways with the hypothetical conditions described.

The most important question about survey items of this type remains to be answered. That concerns their predictive validity. As a consequence, we cannot use such items as the basis for our causal model, or as the basis for quantitative predictions.

For our purposes, we need a regression equation with weights which are interpretable as measures of the causal importance of each variable. Darlington (1968) describes the circumstances under which regression weights can be so interpreted, in the absence of genuine experimental evidence:

a. The dependent variable is affected only by a specified set of measurable variables, and all variables which might affect the dependent variable are either included in the regression equation or uncorrelated with terms which are included;

b. The effect of each of the variables on the dependent variable is linear, or else curvilinear and interactive terms are included in the regression equation;

c. The dependent variable has no effect, either directly or indirectly on any of the independent variables.

We believe that we can produce an empirical equation which meets the first two of these requirements by using a quasi-experimental design. We intend to sample soldiers to fill the cells of a research design based on a factorial combination of the possible causal variables in reenlistment. We believe that the research can be kept to a reasonable size by using a carefully selected fractional factorial (Simon, 1980). Such a design can still provide information about causal effects of individual variables, two-way interactions, and non-linear relationships with quantitative variables. Condition c. presents problems discussed briefly at the end of the paper.

Selecting the Variables

Our main concern in this research are with Darlington's conditions a. and c. Reenlistment research may violate the requirement a. that all causal variables be included, in two ways. First, important causal variables may be omitted from the research. Second, variables which are not causal but which are strongly correlated with other independent variables as well as the dependent variable, are included. These variables can mask the effects of real causal variables.

In order to insure that we identify and include all relevant variables, we are doing two research tasks. First, we are performing what Gene Glass (1977) calls a meta-analysis of the reenlistment research. A meta-analysis is a quantitative integration of existing research literature. In doing this we have already identified dozens of variables from previous research.

We are supplementing this list of variables by a rational analysis of the causes of reenlistment. We not only want to include all causal variables but we want to omit non-causal variables. There are two types of variables which have often been included in previous research which we want to omit. First are variables that are operationally best regarded as dependent or intervening variables. They are frequently highly correlated with reenlistment intentions or decisions but are not causes of reenlistment. In a regression analysis they are likely to mask the effects of true causal variables. Examples of this are measures of satisfaction (Locke, 1976; Brosseau & Lawton, 1981).

The second class of variables which we do not think should be included in our analysis are certain administrative classifications. The best example I can think of is MOS. MOS is not itself a cause of reenlistment intentions or decisions, but it is confounded with a number of variables which probably are, such as selection entry requirements, location of basic training, location of Advanced Individual Training (AIT), difficulty of AIT, duration of AIT, initial assignment location, probable sequence of assignments, rotational frequency, requirements for overseas service, availability of various rotation options, proficiency pay, eligibility for reenlistment options, type of unit assignments, actual task performed, actual duty assignment, type and amount of supervision, type and amount of contact with coworkers, speed of promotions, civilian demand for skills, potential civilian earnings, and long term Army opportunities. We regard it as preferable to examine each of these variables and use the appropriate combination of them to forecast reenlistment for a given MOS, than to include MOS in our analysis, and mask the effects of these potential causes of reenlistment.

We are still in the process of producing as complete a list of potentially causal variables as possible. Clearly this will include biographical and demographic variables, Army experience variables, and especially variables related to personnel management and reenlistment management, like bonus eligibility and amount, career counseling, and assignments. In addition to these, we will have to include measures of civilian opportunities. Once this list is compiled, and the measurement and/or identification operations selected, we intend to perform the multivariate quasi-experiment described above. We intend to collect reenlistment intentions and follow-up measures of reenlistment behavior from each respondent, as well as estimates of reenlistment intentions under hypothetical conditions of assignment, monetary incentives, and civilian opportunities. The only difference between this design and a true experiment is the lack of randomization. We do not believe this will be a problem if we genuinely exhaust the relevant variables.

There is only one remaining problem (aside from the practical ones in actually implementing this research plan). This is the problem presented by the violation of Darlington's (1968) condition c. Recall that this is the requirement that there be no effect of the dependent variable on the independent variables. Our system of variables will clearly violate this

requirement. Reenlistment decisions and reenlistment rates affect reenlistment policy and other aspects of personnel management policy. In some cases there are probable feedback relationships between reenlistment and personnel management variables. Box, Hunter, & Hunter (1978) show that obtained regression equations in such cases may model the feedback system rather that a real causal relationship. We are currently conducting an analysis of the personnel management systems involved to determine the nature of these feedback relationships. We are going to develop the regression equation assuming the consequences of ignoring these relationships are negligible. We are also investigating ways to model feedback systems, so we can revise the model to take them into account if this assumption proves untenable.

The author would like to thank Dr. John Mellinger of ARI for help in formulating the ideas in this paper.

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REGRESSION PREDICTORS OF MILITARY CAREER INTENTIONS

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ABSTRACT

In recent years the Army has experienced difficulty in maintaining numerical manpower levels adequate to accomplish its missions. Two major sources of this problem are attrition - approximately 35% of first-term soldiers attrite prior to their scheduled End of Term of Service (ETS) date - and low rates of reenlistment.

The current project was designed: 1) to determine major personal and organizational correlates of career intentions among Army officers and enlisted; and 2) to explore the implications of these relationships from perspectives of formal Army policy issues and applied personnel management techniques.

Subject selection was random and involved ten percent of the enlisted and thirty percent of the officers assigned to an infantry division as well as the installation and the Army medical center which support it. Respondents completed a 138-item survey dealing with : 1 - personal/demographic characteristics (e.g., age, race, delinquency); 2 - military status indices (e.g., rank, time in service, occupational speciality); 3 - organizational variables (e.g., congruence of training with duty assignment, type of unit mission, job satisfaction); and 4 - expressed career intention, measured on a five-point monotonic scale (with alternatives ranging from "do not intend to complete obligated tour of service" to "intend to stay beyond retirement eligibility." Efforts were taken to assure participants of confidentiality. Items were presented to subjects both orally and in writing to compensate for possible low levels of reading ability.

Statistical procedures involved factor analyses of two scales and regression of putative predictors against career intentions. Six items designed to assess deviancy were submitted to a principle components analysis and subjects' scores were determined by item loadings on the first principle axis. A factor analysis was also performed on responses of enlisted and officers to thirteen military morale questions, drawn either from previous surveys or constructed specifically for the present project. Item correlations were submitted to principle components extraction with orthogonal rotation. Scores were calculated using the "exact method" for three derived dimensions: job satisfaction; perception of unit personnel; and assessment of unit readiness.

Morale factor scores, deviancy scores, and other independent variables which were linearly and logically related to career intention were then employed as predictors of career intentions in separate regression analyses for the two groups. Regression analysis procedures involved both hierarchical and stepwise forward inclusion with tolerance, independent significance, and total number imposed as constraints on resultant predictors.

Results of these regression analyses are presented for enlisted and officers on Tables 1 and 2 respectively. Predictors tended to be more

TABLE 1

Results of Regression Analysis (Enlisted)

Predictor Variable	Beta (Sig)	Simple r	Cumulative R	Amount of Variance Explained
Years in Service	.2878 (.000)	.58	.58	34%
Age	.3456 (.000)	.60	.62	39%
Job Satisfaction	.2966 (.000)	.47	.69	48%
Education	-.0684 (.009)	.07	.70	48%
Race - Black	.0900 (.000)	.10	.70	49%
Occupational Speciality-91	.0786 (.002)	-.01	.70	50%
Perception of Unit Personnel	.0746 (.003)	.13	.71	50%
Occupational Speciality-13	-.0652 (.008)	-.11	.71	51%
Unit - Ranger	-.0489 (.048)	-.07	.71	51%
Religion-Other (not Protestant, Catholic or none.	-.0489 (.049)	-.08	.71	51%

Regression Mean Square = 42.37 (10 degrees of freedom)

Residual Mean Square = .48 (838 degrees of freedom)

F-ration of equation = 87.33, significant at $p \leq .000$

Other Variables with Partial Correlations at $p \leq .08$

Variables	Partial r	Tolerance	F-significance
Unit-Ordnance	.06	.99	.071
Unit-Military Intelligence	.06	.98	.076

TABLE 2

Results of Regression Analysis (Officers)

Predictor Variable	Beta (Sig)	Simple r	Cumulative R	Amount of Variance Explained
Year in Service	.2684 (.019)	.47	.47	22%
Age	.2473 (.039)	.39	.47	22%
Occupational Speciality - Physician	-.2324 (.000)	-.20	.52	27%
Job Satisfaction	.2258 (.000)	.24	.57	33%
Occupational Speciality - Field Artillery	-.1946 (.001)	-.11	.59	35%
Unit - Medical	-.1522 (.034)	-.12	.61	37%
Deviance	-.1636 (.004)	-.15	.63	39%
Occupational Speciality - Dentist	-.1055 (.84)	-.10	.64	40%
Assessment of Unit Readiness	.0974 (.086)	.14	.64	41%

Regression Mean Square = 7.51 (9 degrees of freedom)

Residual Mean Square = .50 (196 degrees of freedom)

F-ratio of equation = 15.33, significant at $p \leq .000$

Other Variables with Partial Correlations at $p \leq .10$

Variables	Partial r	Tolerance	F-significance
Unit-Field Artillery	.19	.11	.007
Rank-Warrant Officer	-.12	.98	.099

parsimonious and efficient for enlisted than for officers. Nevertheless for each group a small number of independent variables accounted for approximately one-half of the variance in the criterion. Age, service tenure, and job satisfaction were found to be very strong predictors for both officers and enlisted. Measures relating to occupational specialty, type of unit, educational level, race, unconventional religious belief, deviance, adjudged unit combat readiness, and perception of fellow unit members were also related to military career plans in one or both groups.

The significance of these correlates is examined in terms of previous research and implications on policy/unit management initiatives are drawn. Finally the report discusses some methodological issues which should be considered in conducting research on military reenlistment.

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PERSONNEL DATA BASES RELATING TO ENLISTED ATTRITION

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Defense Manpower Data Center

I've been asked to give a brief presentation on the data the Defense Manpower Data Center (DMDC) maintains relevant to the study of enlisted attrition.

DMDC serves as a data support organization to the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics). We collect and maintain a number of automated files on DoD personnel, and organize them to provide manpower information in a timely way to OSD staff, and others working in the manpower arena in DoD. DMDC stresses the importance of maintaining its historical files in a way which allows access to older data on the same basis as the most current information in the data base. Our military files are maintained back to FY71. We continue to work on these files with the goal of providing data continuity from 1971 on all elements important to the study of major manpower issues.

Data continuity means approaching the data from three perspectives:

(1) Cross-Service Comparability. We code elements from different services into the same coding scheme to facilitate quick and meaningful comparisons. Across services, occupation codes, for example, differ both in their coding and underlying philosophy from Service to Service. We have tried to overcome these differences by mapping the different service systems into one coding scheme: DoD Occupation Code.

(2) Longitudinal Comparability. Coding schemes change over time, and so do the meanings of elements. Before 1975, reason for separation, for example, was coded using Separation Program Number. This element was not standardized and each service used a completely different system, both in terms of coding and in terms of content. This situation made it very difficult to compare service attrition experience with any degree of confidence. DMDC developed the Interservice Separation Code (ISC) to provide cross-service comparability and to provide a code which could be summarized in a meaningful way. When the change was made to a standard element, Separation Program Designation (SPD), the Interservice coding allowed us to provide the type of continuity needed to bridge the gap between the two coding schemes.

(3) Total Force Perspective. Finally, we try to look at the data from a total force perspective. Coding structures and analytical concepts are applied to other DoD personnel files where appropriate. Civilian occupations have been mapped into the DoD occupation code scheme, for example, so that it's possible to rack up the total DoD full-time workforce, by skill, using one scheme. The Reserves also share many of the same coding schemes and conventions. A retention analysis might profit, for example, by looking at how past policies have affected the flow by occupation into the selected Reserve.

With that perspective on how the files are organized, and the philosophy with which they're maintained, I'd like to briefly identify some of the major files which would be of use in the study of attrition.

The Active Duty Master and Loss is a primary source for information on Active attrition. As with most other DMDC files, we receive an extract from the administrative records systems of the Services. This extract contains about 40 elements of information on the individual. I've shown the most popular elements on the slide.

DMDC FILE DESCRIPTION

ACTIVE DUTY INVENTORY AND GAIN/LOSS TRANSACTIONS

POPULATION : ALL ACTIVE DUTY OFFICER AND ENLISTED PERSONNEL, EXCEPT THOSE ON ACTIVE DUTY FOR TRAINING. GAINS AND LOSSES TO THE ACTIVE FORCE, AND REENLISTMENT AND EXTENSION TRANSACTIONS.

COVERAGE :
- INVENTORY - 30 JUNE 1971 TO PRESENT
- LOSSES - FY 71 TO PRESENT
- GAINS - FY 75 TO PRESENT

DATA ELEMENTS :

IDENTIFICATION	SOCIAL SECURITY NUMBER	NAME
DEMOGRAPHIC DATA	RACE	MARITAL STATUS
	EDUCATION	APTITUDE DATA
	ETHNIC GROUP	NUMBER OF DEPENDENTS
	SEX	AGE
SERVICE DATA	SERVICE DATES	PAYGRADE
	DOD OCCUPATION	ETS DATE
	MOS/AFSC/RATING	DATE OF LATEST ENLISTMENT
	DATE OF LAST PROMOTION	UIC
SEPARATION DATA	SEPARATION PROGRAM DESIGNATOR	INTERSERVICE SEPARATION CODE
	CHARACTER OF SERVICE	DATE OF SEPARATION
	REENLISTMENT ELIGIBILITY	

DMDC has received the inventory and loss files since 1971, the gains since about 1975. The coverage for the files is all Active enlisted and officer personnel, except those on Active duty for training. Like most of our files, we've had to make compromises on the number of elements we get, versus what's uniformly available from the individual services.

I've shown the basic elements of the file divided into four categories: Identification, demographic data, service data and separation information. All our files are individual record files. SSN is the crucial identifier--it

must be correct to allow longitudinal and cross-file matches. Among the elements I've labeled as demographic data, educational level and mental aptitude have become important proxies for "force quality". As a result of the recent norming problems with ASVAB 5,6,7, we have recently added very detailed mental testing data on all enlisted who came onto Active duty since July 1970. The information includes all the raw subtest scores for the various tests which have been administered over the period, and allows us to reconstruct AFQTs and composite scores with maximum flexibility.

Detailed ethnic group information has been available since 1975. This information will allow researchers to track minority attrition with more precision. Prior to the introduction of this element, DMDC did a check of the individual's last name against a Spanish surname file--to identify Hispanic personnel.

Most prominent among the service related data are the elements showing occupational information, the dates of service, information on ETS and date of last promotion.

On losses, the Separation Program Designation is key to the study of attrition. It gives the reason for separation. The SPD is actually composed of two separate codes: The first position gives the discharge type, the second and third positions give the reason. Because of the number of codes in use, and their often similar meanings, DMDC developed the ISC to capsulize the separation reason information. ISC is a two digit code: The first position provides information on broad categories of separation: ETS discharge, medical discharges, and behavioral discharges. The second position provides more detail on the reason for separation. These are the key elements we use to categorize the separation types. Character of Service provides an additional piece of data on the discharge type--honorable, general, et cetera. Reenlistment eligibility is useful in the detailed study of separation--this code indicates the eligibility status, and if the individual is conditionally eligible for reenlistment, what waiver is needed before he can reenlist.

On the Reserve side, the data roughly parallels information available for Active duty people. Unfortunately, DMDC has not had the Reserve files for as long, nor is the data quality as high as the Active duty files. The biggest problem in the study of Reserve attrition revolves around the volatility of the Reserve environment--there is much more movement between components, the length of obligated service is much shorter, and, in addition, you have a lot of movement among the various Reserve categories. The biggest problem in the study of Reserve attrition is the scarcity of information or reason for separation.

What the Reserve files are very useful for, however, is to study the flow between Active Duty and Reserves and how changes in separation policy and attrition patterns can have very significant effects on the manning levels of the Reserves.

DMDC FILE DESCRIPTION

RESERVE FORCES INVENTORY AND GAIN/LOSS FILES

POPULATION : ALL OFFICERS AND ENLISTED PERSONNEL IN THE SELECTED RESERVE, INDIVIDUAL READY RESERVE OR THE STANDBY RESERVE

COVERAGE : INVENTORY - 30 JUNE 1974 TO PRESENT
GAINS AND LOSSES - FY 78 TO PRESENT

DATA ELEMENTS :

IDENTIFICATION	SOCIAL SECURITY NUMBER	NAME
DEMOGRAPHIC DATA	RACE	MARITAL STATUS
	ETHNIC GROUP	MENTAL GROUP
	CIVILIAN AND MILITARY EDUCATION	SEX
SERVICE DATA	RESERVE CATEGORY	YEARS OF SATISFACTORY SERVICE
	TRAINING PAY CATEGORY	ACTIVE SERVICE
	UIC	UNIT ZIP
	DOD OCCUPATION	MOS/AFSC/RATING
	SOURCE OF ENLISTMENT	

The most popular and revealing file DMD maintains for attrition study is the Enlisted Cohort File. This file is a cross file match between an accession cohort group and succeeding Active duty inventory and loss files. The accession record is one supplied by the Military Enlistment Processing Command (MEPCOM). The Cohort file, then, combines all the information available from the Active duty extracts, with a great deal of information available on the individual's characteristics at the time of accession. Results of both the medical and mental testing are available on the MEPCOM record. The Cohort file allows you to set up the accession group by a number of different parameters, then follows that group's progress through the enlisted ranks. DMDC's standard reporting on separation rates for enlisted cohorts, for example, is broken by service, race, educational level, mental category, term of enlistment, reason for separation and length of service at separation. The ways to display this type of data are myriad, however. One interesting variable is the "program enlisted for" data element. This element will show this enlistment option or enlistment bonus the individual elected.

The really interesting challenge is to put the files together in new ways which provide a new perspective on the problem. The Enlisted Cohort File is proving to be a very popular vehicle for studying all sorts of personnel issues. With over ten years of history available, this file is being increasingly used for the comparison of pre/post AVF attrition and retention behavior, and looking at attrition and retention behavior during the second and third term of service.

The large number of years available also allows us to look back before the end of the draft, and to compare attrition experience of the pre-AVF

DMDC FILE DESCRIPTION

ENLISTED COHORT FILE

POPULATION : ENLISTED ACCESSIONS AS REPORTED BY MEPCOM FOR A GIVEN FISCAL YEAR MATCHED AGAINST SUCCEEDING ACTIVE DUTY INVENTORY AND LOSS FILES.

COVERAGE : FY 71 THROUGH FY 80 ENLISTED ACCESSIONS

DATA ELEMENTS :

IDENTIFICATION	SOCIAL SECURITY NUMBER	NAME
DEMOGRAPHIC DATA	RACE	MARITAL STATUS
	EDUCATIONAL LEVEL	MENTAL TESTING
	SEX	PHYSICAL CHARACTERISTCS
	MEDICAL TEST INFORMATION	AGE
	ETHNIC GROUP	RELIGION
	NUMBER OF DEPENDENTS	
SERVICE DATA	SERVICE DATES	GRADE AND PROMOTION DATA
	CURRENT OCCUPATION	TRAINING OCCUPATION
	ENLISTMENT BONUS	ENLISTMENT PROGRAM
	TERM OF ENLISTMENT	UIC
	MEDICAL/MORAL WAIVER	
SEPARATION DATA (IF SEPARATED)	SEPARATION PROGRAM NUMBER	INTERSERVICE SEPARATION CODE
	CHARACTER OF SERVICE	REENLISTMENT ELIGIBLITY
	DATE OF SEPARATION	

group with those who entered in more recent years. Using draft lottery totals, we are also able to divide those who volunteered before the end of the draft into two categories: True volunteers and draft motivated volunteers.

Another type of cross file match would allow tracking of the flow from the Active force into the Reserves. Two areas of study might prove interesting. One would be to track the effect of changing attrition policy on the movement of personnel into the IRR and selected Reserve. Changes in the number and reason for separation of those leaving Active duty can have a dramatic effect on the ability of the Reserves to meet end-strength goals. Cross file linkages will allow the researcher to track the flow between components and to establish relationships between Active duty trends and corresponding changes in the Reserves.

Finally, we might consider using files available at DMDC to widen the time horizon when we start to track individuals. Files exist which would allow tracking of an individual from the time of his first examination at the AFEES station, through the delayed entry program, onto Active duty. Work done at DMDC for Rand shows that the number of people who qualify for entry but don't enlist is quite large. This large pool of manpower might

be a further area of study. Likewise, we don't know much about those who attrite from the delayed entry program. Rough estimates show the number to be between 16 and 20 thousand a year. Clearly, those individuals are interested in the military. What factors are associated with the attrition, and what interventions could help to lower the number leaving from the DEP?

This brief talk was intended to provide an overview of DMDC files, and to highlight different ways that the files could be put together to answer research questions on attrition. Other files exist at DMDC which might be useful in providing other attribute data on individuals in the military. If you are anticipating working in this area, get in touch with DMDC and we will be happy to talk about data specific to the questions you are trying to answer.

MANAGEMENT OF UA AND ATTRITION IN THE MARINE CORPS

Ann Majchrzak
Westat, Inc.

During the period following termination of the draft, attrition and unauthorized absences (UA) have emerged as serious problems warranting the attention of Marine Corps policymakers and manpower planners (c.f. Goodstadt & Glickman, 1975; Sinaiko, 1977). Although there has been considerable research on identifying factors related to attrition and UA (e.g., Foch, 1979; Greenberg & McConeghy, 1977; Haber, 1975; Holberg & Berry, 1977), there has been little research focused on the management of these problems. Specifically, what has been lacking in the research efforts to date is the development of a set of activities which can be implemented at the unit level to reduce attrition.

In response to this gap in previous research activities, a three-year research effort was undertaken in order to develop organizational interventions to reduce UA and attrition. Although the research effort is only in its second year of operation, essentially two major sets of implications have surfaced to date. These two sets of implications -- methodological and policy-relevant -- are discussed separately.

Methodological Implications

A major methodological implication of our research effort has been the development of a methodological approach for developing management actions to reduce attrition and UA in the military. The methodological approach consists of four major steps:

1) Documentation of the problem;

2) Qualitative field study to generate hypotheses about potential causal factors and management actions;

3) Quantitative field study to test hypotheses and develop potential management programs; and

4) Field-testing of management programs, including the feasibility-assessment of implementation scenarios with military personnel.

The four stages of this methodological approach allow for the evolution of the research effort, such that each stage is dependent upon the results of the previous stage. Furthermore, this approach allows for a substantial amount of interaction with military personnel, ranging from open-ended discussions with NCO's in the field to comments from Headquarters staff. With this approach, then, problems of less extensive research efforts can be overcome, yielding recommendations which are acceptable, implementable, and useful.

Policy Implications

Since the project has not yet been completed, all results to this point are fairly tentative. Nevertheless, thus far, we have engaged in structured interviews with 64 enlisted men and unit leaders (Majchrzak & Goodstadt, 1980), as well as countless open-ended discussions with Marine Corps personnel. The intent of these interviews and discussions was to ascertain those unit-level factors affecting UA and attrition which are open to management intervention. Then, once these factors have been identified, unit management techniques affecting these factors were to be tentatively suggested for reducing UA and attrition.

Stemming from the interviews and discussions, several factors were identified which appeared to adversely affect UA and attrition:

- Lack of knowledge by unit commanders of the trends in UA and attrition for the unit;
- Inconsistent application of discipline by unit chain of command;
- Lack of problem resolution counseling for enlisted personnel;
- Underlying assumptions made by the chain of command concerning causes of UA and violations;
- Inadequate integration of individual into unit;
- Limited options available to small-unit leaders for managing problem personnel; and
- Inadequate knowledge of small-unit leaders about options available to help personnel with problems.

The influence of these factors on UA and/or attrition have received some empirical support from other researchers (e.g., Affourtit, 1979; Greenberg & McConeghy, 1977; and Goodstadt & Nieva, 1978). Therefore, based on the factors identified, a number of potential management actions to reduce attrition and UA were suggested. These management actions, which need to await further empirical validation and development, included:

- A UA and attrition information system for use by unit commanders;
- Mechanisms for increasing consistency among the chain of command in managing problem personnel;
- A problem-resolution approach to the management of problem personnel;
- Awareness by unit leaders of the role of attitudes and prejudgements on UA and attrition;

- Mechanisms for integrating individuals into the unit; and
- Increasing the known options available for small-unit leaders to manage problem personnel.

To empirically validate the effects of the identified factors and management actions on UA and attrition, a quantitative field study was undertaken. Questionnaires were developed and administered this Spring to commanders and staff NCO's in 92 Division, FSSG, and Air Wing units. The survey data were then merged with administrative data on attrition, desertions, and UA. The analysis, now underway, is focused on assessing the interrelationships between management actions and unit UA and attrition rates. Those management actions found to relate to attrition, UA and desertion will be combined into "management programs." The programs will then be field-tested next year in order to more completely validate their effects on UA and attrition. Although we are not at liberty to discuss preliminary results of this analysis, we are optimistic about the possibility of developing a management program that is acceptable, implementable, and useful.

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PSYCHOLOGICAL APPROACHES TO MARINE CORPS RECRUIT ATTRITION

Irwin G. Sarason
University of Washington

This project is concerned with Marine Corps recruit attrition. Attrition is regarded as a special case of performance and factors that lower attrition are assumed usually to enhance performance. The project is concerned with the following relationships:

(1) the role of individual differences in attrition among recruits.
(2) the effects of televised modules on attrition
(3) the contribution of the training unit environment to attrition.

The process of recruit training has been studied thoroughly at the Marine Corps Recruit Depot (MCRD), San Diego. Most recruit attrition occurs before the end of the first phase of training and 45 to 50% of all recruit attrition is due to psychological or behavioral causes. Recruits' locus of control is significantly related to attrition: Recruits who are external in their locus of control have the highest, and internals have the lowest, attrition rates. The effects of recruits' education and demographic factors depend importantly on the characteristics of the drill instructors who make up the training team. In one study recently carried out at MCRD, high school nongraduates had exceptionally high attrition rates, but only for those who were in platoons whose drill instructors typically have high recruit attrition rates. High school nongraduates who were placed in low attrition platoons showed average or below average attrition.

In one study, platoon attrition ranged from 0% to 28%; in another study the range was from 2.3% to 13.4%. Drill instructors who have high platoon attrition rates tend to emphasize the need for recruits to be obedient and tend to under-value recruits' motivation to become exemplary Marines. Drill instructors who have low attrition rates tend to emphasize their own roles as models, teachers, and parent surrogates to recruits.

Televised modules dealing with ways by which recruits can enhance personal control over their behavior have been developed. The first of these is now being evaluated. Recruits who have seen it rate their training tasks as being more difficult than do recruits who have not seen it. However, the recruits who have seen it are more likely than the others to believe they can meet training challenges. That is, they have more self-confidence.

Research is being conducted on individual differences among drill instructors that may influence recruits. As a result of this work, relevant televised training modules can be produced for use in Drill Instructor School.

The findings of this project support an interactional view of military training. In addition to the training program per se, it is necessary also to analyze relevant person-by-situation interactions that play roles in the training process.

NAVY QUALITY OF LIFE AND REENLISTMENT

Jean W. Fletcher
Center for Naval Analyses

The research objective is identification of areas of dissatisfaction with Navy life which adversely affect retention. The Navy has devoted much effort in recent years to improving the quality of Navy life. Funding has been increased for counselling, recreation, shipboard habitability and other programs designed to improve morale. Estimation of the relationship between attitudes toward working and living conditions and reenlistment probability can provide guidelines for allocation of quality of life program funds.

The Navy Occupational Task Analysis Program (NOTAP) survey collects data from representative samples of personnel working in each Navy rating. NOTAP data contains detailed information on attitudes toward Navy life. Respondents provide evaluations of pay, housing, training, supervision, and other facets of Navy life. NOTAP data, used in conjunction with Enlisted Master Records, provide information necessary to relate expressed attitudes toward Navy life to subsequent reenlistment decision.

The study population was composed of personnel in the hospital corpsman (HM), aviation electricians mate (AE), aviation structural mechanic (AM), aviation electronics technician (AT), aviation antisubmarine warfare operator (AW), and mess management specialist (MS) ratings. These ratings had relatively recent NOTAP surveys, had adequate sample sizes, and they covered a range of technical and non-technical jobs.

Factor Analysis was used to reduce the data to manageable proportions. From the 67 NOTAP job satisfaction items, three categories of factors were identified. They were pay, quality of job, and quality of military life. Quality of job factors included autonomy, physical work environment, skill utilization, team effort, and relationships with peers, supervisors, and subordinates. Quality of military life factors included deployment time, housing, duty station, medical services, and ship habitability. The factors were generated independently, but are intuitively appealing and very consistent across ratings.

A trinomial logit model was used to estimate the probability making each of three choices (leave, extend, reenlist) as functions of demographic variables, military job, life, and pay factors, and service controls. Separate estimates were obtained for first-term and career personnel. First term results show pay as consistently important in retaining first-term personnel. Satisfaction with the job factors, which can generally be improved by effective leadership and personnel management, is also related to increased probability of reenlisting or

extending. The significant factors vary by rating, but this is not surprising given the diversity of job content across ratings.

The military life factors are more tangible and identifiable with Navy Quality of Life programs. With few exceptions, they are not related, as expected, to first-term retention. However, a very different picture is presented by results for career personnel. There are still some significant job factors in the reenlistment equation, but there is an incease in the number of military life factors which significantly increase retention probability. Duty station choice, housing, and medical services are important in the career reenlistment decision across several ratings.

In summary, the use of pay in the past to increase reenlistments is once more justified. Beyond that, improvements in personnel management may improve retention for first-termers, while further quality of military life improvements will have the greatest retention payoff if expenditures and programs are targeted toward career personnel.

MODELLING THE REENLISTMENT DECISION

Matthew S. Goldberg
Center for Naval Analyses

CNA developed the Annualized Cost of Leaving (ACOL) model to project the effects of changes in military compensation on the size and composition of the Navy enlisted force. The ACOL model does this by recognizing that the reenlistment rate depends upon the differential between military pay and the civilian pay that enlistees could earn by leaving the military. The model computes the change in this pay differential that results from a change in compensation policy, and transforms it into a change in the reenlistment rate and the resulting enlisted force profile.

The ACOL model has been supported and used extensively by manpower planners and compensation managers in both the Navy and the Defense Department. In 1981, both organizations requested that CNA evaluate the accuracy of the ACOL model projections, and refine the model if necessary in order to improve its accuracy.

Using data through 1977, CNA computed the ACOL model projections for 1978-1980. These projections were compared to those of an earlier CNA model, the PROPHET model, as well as to the actual historical experience over the period 1978-1980. The PROPHET model applies historical reenlistment rates throughout the projection period. In fact, military pay declined by 5.9 percentage points relative to civilian pay over the period 1978-1980. Because the PROPHET model does not adjust reenlistment rates for changes in relative military pay, it overpredicted the enlisted force by 6.3 percentage points. By contrast, the ACOL model projections were accurate to within 4.0 percentage points.

Using historical data over the period 1977-1980, CNA developed two refinements that improve the accuracy of the ACOL model projections. First, the effect of civilian unemployment on the reenlistment rate was incorporated into the model. Since increased civilian unemployment represents a deterioration in the alternatives to military service, an increase in civilian unemployment will lead to an increase in the reenlistment rate. Then, the effect of first-term reenlistment bonuses on the second-term reenlistment rate was incorporated into the model. Bonuses paid to individuals who reenlist at the end of their first term of service will induce reenlistments on the part of marginal individuals having lower tastes for military service than those who would have reenlisted even without the bonuses. These marginal individuals will be less likely to reenlist again at the end of their second term of service. Now, the ACOL model projections can take account of civilian unemployment and the effects of first-term bonuses on future as well as contemporary reenlistment rates.

ACOL model projections for the period 1978-1980 that incorporate both the effects of civilian unemployment and the persistent effects of first-term reenlistment bonuses have been computed. They are accurate to within 1.5 percentage points. Both positive and negative projection errors were generated, so that the average projection error was approximately zero.

CNA has permanently adopted the two refinements to the ACOL model. Demonstration of the accuracy of the refined model has greatly enhanced the confidence with which its projections are used by both the Navy and the Defense Department. The ACOL model is now widely considered to be the most accurate enlisted force projection model available.

APPENDIX A

Workshop on Attrition Research

sponsored by
Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs, & Logistics)
and
Office of the Under Secretary of Defense (Research & Advanced Technology)

The Rand Corporation
Santa Monica, California

31 August-2 September
1981

AGENDA

Monday, 31 August, AM — Chair: Thomas Sicilia, OASD(MRA&L)

9:00 Welcome and administrative announcements

Attrition: Multi-Faceted Programs

9:15 Bruce Meglino and Stuart Youngblood, University of South Carolina: Longitudinal and experimental analyses of first term enlisted attrition (includes excerpts from videotape modules)

10:35 Coffee

11:00 Wallace Sinaiko, Smithsonian Institution, and Kenneth Scheflen, Defense Manpower Data Center: Cross-national analyses of attrition

11:40 Kenneth Finstuen, Air Force Human Resources Laboratory: Air Force attrition research: Analysis of pre- and post-enlistment factors

12:15 Lunch

Monday, 31 August, PM — Chair: Cheryl Cook, Rand

1:45 Richard Elster, Naval Postgraduate School: NPS thesis research on enlisted attrition

2:25 Linda Doherty, Navy Personnel Research and Development Center: Four ongoing studies of attrition: Longitudinal analysis, use of separation questionnaires, correctional custody units, and compensation factors

3:20 Coffee

3:45 Jules Borack, Navy Personnel Research and Development Center: A research and development plan for retention

Attrition: New Basic Research

4:10 William Mobley, Texas A&M University: Adaptation to new work situations

4:50 Adjourn

Tuesday, 1 September, AM — Chair: CDR Paul Chatelier, OUSDR&E(R&AT)

Attrition: Special Problems, Special Categories of People

9:00 Richard Buddin, Rand: Post-training enlisted attrition

9:40 Kent Eaton, Army Research Institute: First tour attrition rates of men and women

10:10 James Blandin, Naval Postgraduate School, and James Morris, Santa Clara University: Predicting attrition among non-high-school-graduate Army enlistees

10:40 Coffee

11:10 Mark Butler, Naval Health Research Center: Environmental factors and retention decisions of health care providers

11:50 Robert Lakota, Navy Personnel Research and Development Center: RETAIN: Counter-attrition for general detail seamen

12:30 Lunch

Tuesday, 1 September, PM — Chair: Kenneth Coffey, GAO

Attrition: Methodological Issues

2:00 Barry Goodstadt, Westat: A unit level approach to attrition research: Documenting the chain of command's role in discharges

2:40 Philip Lurie, Center for Naval Analyses: Continuous estimates of enlisted survival

3:10 Coffee

3:30 George Lawton, Army Research Institute: Methodological problems in the modeling of Army reenlistment decisions

4:00 John Allen, Army Research Institute: Regression predictors of military career intention

4:40 Robbie Brandewie, Defense Manpower Data Center: Personnel data bases relating to enlisted attrition

5:10 Adjourn

Wednesday, 2 September, AM — Chair: James Hosek, Rand

Managing Attrition

9:00 Anne Majchrzak, Westat: Management of unauthorized absences and attrition in the Marine Corps

9:40 Irwin Sarason, University of Washington: Psychological approaches to Marine Corps recruit attrition; role of the training unit environment (includes excerpts from videotape modules)

10:30 Coffee

Retention

11:00 Jean Fletcher, Center for Naval Analyses: Navy quality of life and reenlistment

11:30 Matthew Goldberg, Center for Naval Analyses: Modeling the reenlistment decision

12:00 Wrap-up

12:30 Adjourn

APPENDIX B

OASD(MRA&L) and OUSDR&E(R&AT) Workshop on Attrition Research

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Officer in Charge
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Director, Human Resource Management
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NAS Pensacola, FL 32508

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Pearl Harbor, HI 96860

Commander in Chief
Human Resource Management Division
U.S. Pacific Fleet
Pearl Harbor, HI 96860

Officer in Charge
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Naval Base, Charleston, SC 29408

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Millington, TN 38054

Commanding Officer
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Commanding Officer
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Director, Human Resource Training
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Naval Amphibious School
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Officer in Charge
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Manpower R&D Program - List D

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Air University Library/LSE 76-443
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